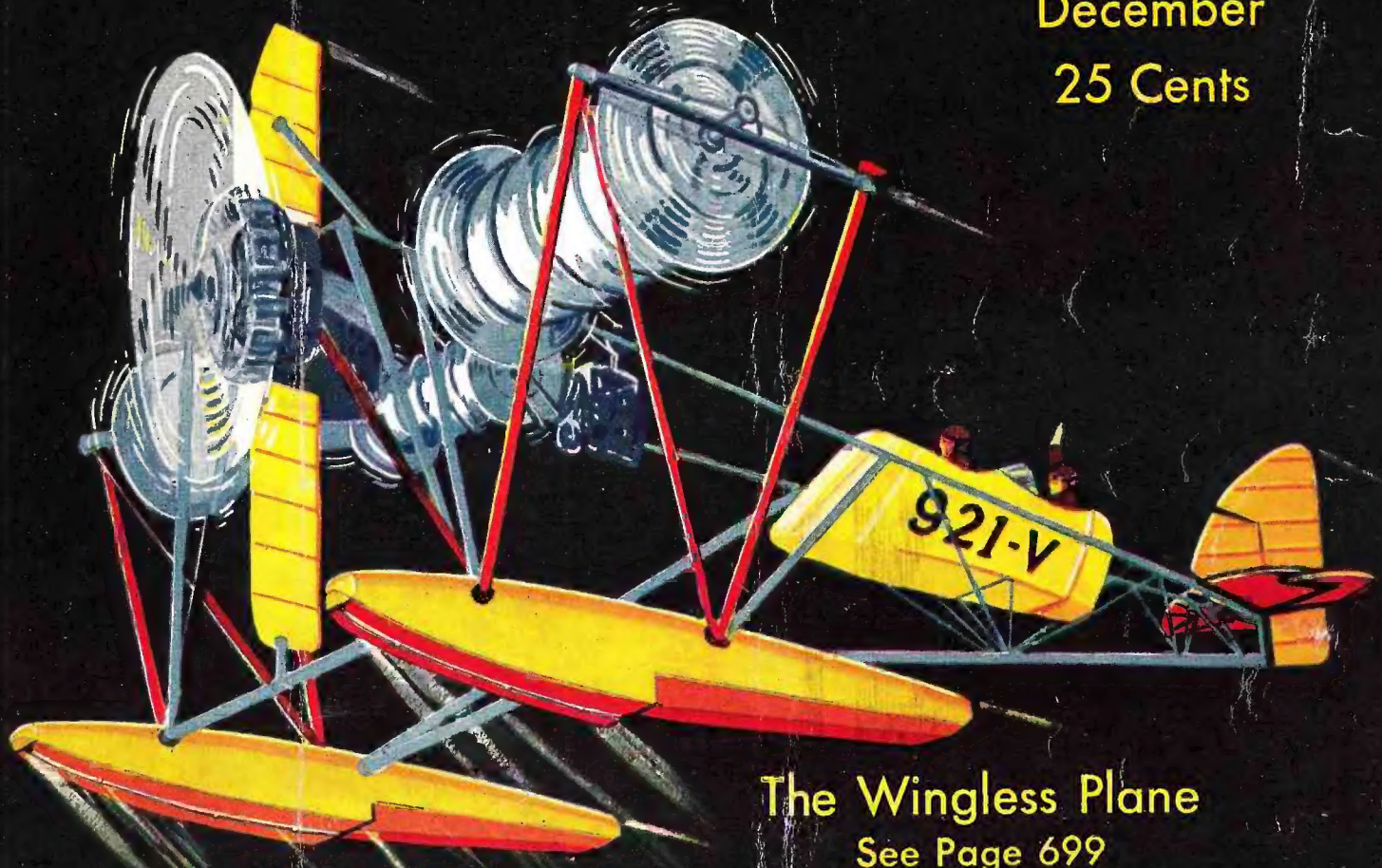
Science and Invention

December
25 Cents



The Wingless Plane
See Page 699

Why Are Circus Freaks

Why Television Images Split

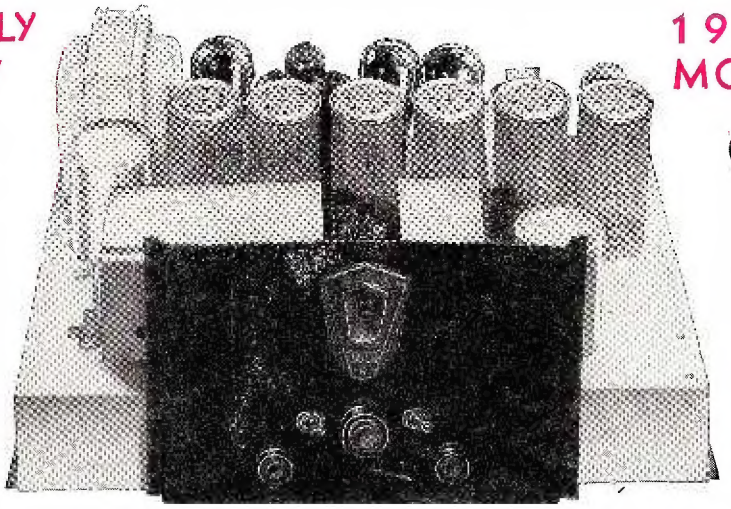
Build This Record Breaking Outboard

DAVID HYMES

Win a Share of $3,250.00 in Fine Tools and Equipment

WHOLLY NEW

1931 MODEL



10 TUBES

« « « «

EMPLOYS HOPKINS BAND-REJECTOR SYSTEM

10 KILOCYCLE STATION SEPARATION

« « « «

WORLD-WIDE RECEPTION!

WHEN RADIO'S HISTORY IS FINALLY WRITTEN THIS AMAZING SUPER WILL BE SET DOWN AS

THE FIRST « « « REALLY GREAT RECEIVER

In the development of all arts and devices, there stand out epochal, basic achievements toward perfection. Motor car men know exactly the feat that marked the turning point to today's unfailing reliability of the automobile. The aviation expert knows what 'plane established the pattern of design and construction to insure safe travel through the air.

And, we know enough of radio now to make this bold claim that this wonder 1931 H. F. L. Mastertone 10 marks entry to an entirely new era in this new art.

The Super's the Thing!

Long known to be the ideal circuit for receiver use, it remained for H. F. L. to adapt the super-heterodyne to practical home reception. True to its name, the super has been the superior set in power, in selectivity, in pure tonal quality. Yet to combine these qualities with the demanded simplicity of control and ease of operation was a task that baffled radio's best engineers for years.

Now we have **all** these features in a history-making receiver and at a price that bespeaks the genius and cleverness of today's engineering skill and manufacturing ingenuity.

Awe-Inspiring in Action!

This receiver is actually, definitely revolutionary. It sets up entirely new standards of design, building and performance. Operation of silky smoothness that thrills you to new heights of radio enjoyment. Sharpness of selectivity that is truly breath-taking in its surprising precision. A sweet, full tone quality that is inspiring in its sheer naturalness! Power and reach that awes even the hardened, experienced DX explorer!

Why It is Different

H. F. L. exclusively uses the newly perfected Hopkins Band Rejector System, a circuit of which you will hear much from now on in radio. By this method, the width of the band may be adjusted to **absolute precision, without impairment of the audio.** Tune the entire scale in steps of 10 kilocycles, just as surely as you set the clock! Distant stations reproduced **with the same clarity and definiteness as locals!**

Try It at Home

Surging power that lays the world of broadcast at your finger tips! Tone that lifts you to the realm of illusion with the artists before you—reproduction that elevates you to hitherto unscaled heights of musical enjoyment.

Give H. F. L. the chance to prove all these unusual claims. Test the giant power of the Mastertone in your own home. Experience its uncanny separation of stations. Thrill at its amazing reach into the far corners of the world. Do this all at our risk.

Book Tells All

Details of this history-making receiver and our new policy of distribution, placing this wonder set within the reach of all, are set out in a new Brochure. Send for and get this book without cost or obligation. No salesman will call on you—you will not be importuned to buy. Write now. You owe it to yourself to know all about the H. F. L. Mastertone 10 before purchase of any new set.

HIGH FREQUENCY LABORATORIES

DEPT. F-930, 3900 CLAREMONT AVENUE

CHICAGO, ILLINOIS

AMERICA'S LOWEST PRICED FINE RADIO!

H·F·L

MASTERTONE SUPER 10

HIGH FREQUENCY LABORATORIES, Dept. F-930
3900 Claremont Ave., Chicago.

Without cost or obligation, please send me a copy of your new Brochure describing the new 1931 H. F. L. Mastertone 10 and your liberal selling policy.

Name_____

Address_____

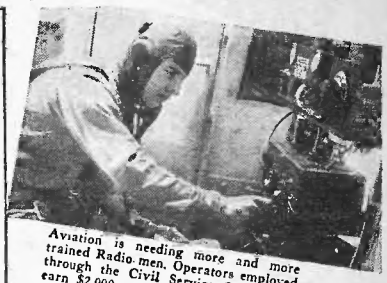
City_____ State_____

www.americanradiohistory.com

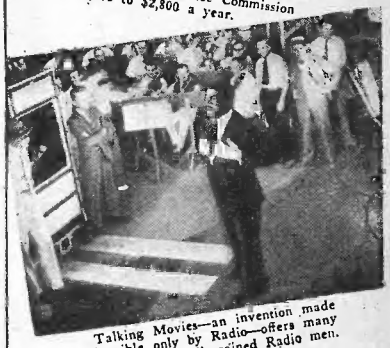
Broadcasting stations need trained men continually for jobs paying $1,800 to $5,000 a year.

Television—the coming field of many great opportunities—is covered by my course.

Operators on ships see the world and get good pay plus expenses.



Aviation is needing more and more trained Radio men. Operators employed through the Civil Service Commission earn $2,000 to $2,800 a year.



Talking Movies—an invention made possible only by Radio—offers many fine jobs to well trained Radio men.

You'll Get *Thrills*-Adventure BIG PAY in RADIO

J. E. Smith, Pres.

I will Train You at Home to Fill a Fascinating Job in Radio

Radio's Amazing Growth is Opening Hundreds of Big Jobs Every Year

You like action, romance, thrills! You'll get them in Radio—plenty of them! Big pay, too. That is why I urge you to mail the coupon below for my free book of startling facts on the variety of fascinating, money-making opportunities in this great, uncrowded field. It also explains how you can quickly learn Radio through my amazingly simple 50-50 method of home-study training, even though you may not now know the difference between a "Screen Grid and a Gridiron". Thousands of men who knew absolutely nothing about Radio before taking my course are today making real money in this growing industry.

Thrilling Jobs That Pay $50 to $100 a Week

Why go along with $25, $30 or $45 a week in dull, no-future work when there are plenty of good jobs in Radio that pay $50, $75 and up to $250 a week? For instance, by taking my training, you can see the world in grand style as a Radio operator on shipboard. There are many splendid openings in this line with good pay plus your expenses. You'll also find thrills and real pay in Aviation Radio work. Broadcasting is another field that offers big pay and fascinating opportunities to men who know Radio. And think of the great, thrilling future for men with *Radio training* in Television and Talking Movies. My free book tells all about these and many other branches of Radio that bring you in contact with interesting people, pay big money and make life pleasant for you. Without doubt, Radio training is the key that opens the way to success. And *my* training, in particular, is the *only* training that makes you a *"Certified RADIOTRICIAN"*—the magic words that mean valuable recognition for you in whatever type of Radio work you take up after graduation. You'll see *why*, when you receive my interesting book.

Earn While You Learn

You don't have to quit your present job to take my course! You stay right at home, hold your job, and learn in your spare time. (Lack of high school education or Radio experience are no drawbacks.) I teach you to begin making money shortly after you enroll. My new practical method makes this possible. I give you eight big laboratory outfits that teach you to build and service practically every type of receiving set made. Many of my students earn $15, $20, $30 weekly while learning. Earle Cummings, 18 Webster St., Haverhill, Mass., writes: "I made $375 in one month in my spare time, installing, servicing, selling Radio sets." And let me emphasize right here that a Radio business of your own is one of the money-making opportunities my training prepares you for in case you wish to settle down at home.

Get My Free Book

Send the coupon below for my 64-page book of opportunities in Radio and information on my home-study training. It has put hundreds of fellows on the road to bigger pay and success. It will tell you exactly what Radio offers you, and how my Employment Department helps you get into Radio after you graduate. I back my training with a signed agreement to refund every penny of your money if, after completion, you are not satisfied with the Lesson and Instruction Service I give you. Fill in and mail the coupon NOW!

J. E. SMITH, Pres., Dept. ONSSS
National Radio Institute,
Washington, D. C.

Act Now

Mail Coupon Today

J. E. SMITH, *President*
National Radio Institute, Dept. ONSSS
Washington, D. C.

Dear Mr. Smith: Send me your book "Rich Rewards in Radio" giving information on the big-money opportunities in Radio and your famous 50-50 method of home-study training. I understand this places me under no obligation and that no salesman will call.

Name.....

Address.....

City..... *State*.....

Occupation.....

Travelled 75,000 Miles

"Dear Mr. Smith: I have worked as Junior Operator on board S. S. Dorchester and Chief Operator of the Chester Sun. I have travelled from 75,000 to 100,000 miles, visited ports in various countries, fished and motored with millionaires, been on airplane flights, etc. I am now with Broadcasting Station WREN." (Signed) Robin D. Compton, 1213 Vermont St., Lawrence, Kansas.

$400 a Month

"The Radio field is getting bigger and better every year. I have made more than $400 each month and it really was your course that brought me to this." J. G. Dahlstead, 1484 So. 15th St., Salt Lake City, Utah.

Employment Service to all Graduates

www.americanradiohistory.com

DECEMBER
1930

Science and Invention

VOL. XVIII
No. 8

TABLE OF CONTENTS

A Model City 676
New York as it may look in 1980

Editorial 682
When Scientists Foregather—By A. Dinsdale

Movie Portrays City of the Future 685
Edwin Schallert describes thrilling scenes and incidents from "Just Imagine," a new Fox Movietone film

Houses of Mud 688
Not so crazy, either—By Walter Raleigh

Plant Your Bulbs Now 689
Dr. E. Bade gives some timely information

Holes That Keep Out the Wind 690
A new lattice is the solution to the anomaly—By Dr. Alfred Gradenwitz

Why Are Circus Freaks 691
Dr. Frederic Damrau, M.D., provides a scientific explanation

Will America Capture World's Olive Oil Market? 692
The olive branch, emblem of peace, provides new industry for U. S.—By Count A. N. Mirzaoff

Try Now—for Your Share of $3250.00 694
Details of our new contest—it's too good to miss

Natural Gas—A New Industrial Giant 697
More power and wealth from the bosom of the earth

Which Wood Shall I Use? 704
Your question answered by the Research Branch of the U. S. Forest Service

Testing Roads in the Laboratory 713
Even road materials are not immune from the knights of the microscope

Space, Time, and Relativity 716
An interesting chat by Dr. Donald H. Menzel, of Lick Observatory

Aviation

The Rotor Plane 699
John E. King explains the principles of the new mystery plane pictured on the cover

Ice Shuns Sweetened Wings 717
Don Charles explains measures taken to prevent ice formation on airplane wings

General

The Safety Valve 678
Conducted by Joseph H. Kraus

Caches 695
Food stores the world over, in pictures and prose

Bridges the World Over 698
A wonderful pictorial survey

Would You Believe It? 703

In the Spotlight of Science 705
Eight pages packed full of fascination

The Oracle 729

Forecast 739
By the Official Forecaster

Scientific Book Reviews 755

Index to Advertisers 766

Radio

Locating Gold by Radio 687
By G. H. Dacy

Why Television Images Split 702
By A. Dinsdale

What's New in Radio 727

Construction, Amusement, Experiment

How to Build this Record-Breaking Outboard Boat 700
By J. Phillips Dykes, Rear Commodore and Secretary, American Outboard Association

A Built-in Wardrobe 714
By H. L. Weatherby, Director of Manual Training, Montgomery County Schools, Montgomery, Alabama

Interesting Experiments with Tin Cans 715
By J. Edmund Woods, D.Sc.

Making a Compact Dressing Table 718
By J. E. Lovgtt

Overhauling the Car for Winter 720
By Arthur George, Consulting Engineer

Magic 721
By Dunninger

For the Home Machinist 722
By George A. Luers

Physical Properties of Water 723
By Raymond B. Wailes

Wrinkles and Recipes 724

Prize Puzzles to Polish Your Wits 725
By Sam Loyd

Try These in Your Own Workshop 726

A Motor Driven Sea Sled 728
By F. B. Charrelear

Scientific Problems and Puzzles 730
By Ernest K. Chapin

How to Make a Brass Novelty Box 736
By George A. Smith

Efficient Gasoline Lamp Filter 738

Electric Terminals Bent with Simple Hand Tools .. 756

Home Improvement

Converting Your Basement 696
A summary of prize-winning entries in our basement improvement contest

Scientific Aids to Your Comfort 719
By Mary Jacobs

Science and Invention's Service to Home Owners 767

New Devices and Developments

Therapeutic Heat; For the Sickbed 767

For Inventors

Patent Advice 732

Yankee Brains at Work 734

25c a copy
$3.00 a year

Published Monthly by
RADIO-SCIENCE PUBLICATIONS, Inc.
184-10 Jamaica Avenue, Jamaica, N. Y.

$3.50 in Canada
$4.00 in Foreign

Publishers, B. A. MacKinnon and H. K. Fly; Editor, Joseph H. Kraus

Entered as second class matter at the Post Office at Jamaica, N. Y., under the act of March 3, 1879.
Title Registered at the U. S. Patent Office. The contents of this magazine must not be reproduced without giving full credit to the publication.
Copyright, 1930, by Radio-Science Publications, Inc. Editorial and Executive Offices, 381 Fourth Avenue, New York, N. Y.
All Rights Reserved.

www.americanradiohistory.com

R. T. I. R. T. I. QUALIFIES YOU TO MAKE MONEY AND ITS SERVICE KEEPS YOU UP-TO-THE-MINUTE ON THE NEWEST DEVELOPMENTS IN RADIO, TELEVISION, AND TALKING PICTURES **R. T. I.**

RADIO WANTS MEN

TRAINED AS R·T·I TRAINS THEM AT HOME *for* PRACTICAL WORK

Radio wants trained men and pays them well. This great industry would rather pay Big Money to men trained as R. T. I. trains them, than low wages to untrained "tinkers" and "guessers." Trained radio men can easily make $40 to $50 per week and upwards. With training and experience many make $75 to $100 per week and are always in demand. Get the inside facts from leading radio men in the free "R. T. I. Radio Opportunity Book."

BETTER JOBS—BIGGER PAY

R. T. I. offers you the way to get into Radio *right*, and the definite path to the *Better Jobs* and *Bigger Pay*. You need no experience to start. You can quickly make $10 to $20 per week Extra Money in spare time while learning.

APPROVED TRAINING

R. T. I. training is endorsed by leading Radio Concerns and Radio Trade Associations. It is prepared and supervised by well known men in different branches of radio. You will find it interesting, practical, thorough and easy to understand.

LEARN AT HOME

Why? Because the fellow who trains at home the R. T. I. way learns rapidly and makes a most valuable man. R. T. I. gives you the training the radio industry wants you to have for important, well-paid work.

Make your success certain. Start R. T. I. training in radio now. Go on up in this great money-making industry that is becoming part of all our daily life. Entertainment, Education, Business, Transportation, News—all depend more and more upon radio.

GET PAID FOR WHAT YOU KNOW

Be a trained man. R. T. I. gives you money-making radio training and keeps you up-to-the-minute with its service. No more worry about jobs when you complete R. T. I. training.

TELEVISION

This amazing new branch of radio is part of the R. T. I. training. (No extra charge.) Be prepared for this new work—Television Service-men will soon be in demand.

TALKING PICTURES

Require trained men—in the studios—the theatres—for servicing and installing the apparatus, and R. T. I. training covers this, too. Broadcasting Stations; Airplane Radio Apparatus; Sea-going Ship Radio Operating; Radio factories; Short Wave Work; Receiving Set Servicing; Selling; Repairing, etc. All these opportunities are included in R. T. I. training.

Free Opportunity Book

Get the facts about the opportunities in Radio, Television and Talking Pictures in this wonderful book—it is free.

Mail Coupon for Big FREE BOOK

Let F. H. SCHNELL and the R. T. I. Advisory Board Help You

20 years' Radio Experience. First to establish 2-way amateur communication with Europe. Former Traffic Mgr. of Am. Radio Relay League, Lieut. Com. U. S. N. R. Inventor and Designer. Cons. Radio engineer.

Assisting him is the R. T. I. Advisory Board, composed of men prominent in the Radio Industry—manufacturing, broadcasting, engineering and servicing. All these men know Radio and will help you succeed in their field.

RADIO & TELEVISION INSTITUTE
4806 St. Anthony Ct., Chicago, Dept. 919

THE R. T. I. ADVISORY BOARD. These men are executives with important concerns in the radio industry—manufacturing, sales service, broadcasting, engineering, etc., etc. They supervise R. T. I. Work Sheets, Job Tickets, and other training methods.

RADIO & TELEVISION INSTITUTE
4806 St. Anthony Court, Chicago, Dept 919

Send me Free and prepaid your BIG RADIO OPPORTUNITY BOOK, "Tune In On Big Pay," and full details of your three-in-one Home Training (without obligating me in any way).

Name.....

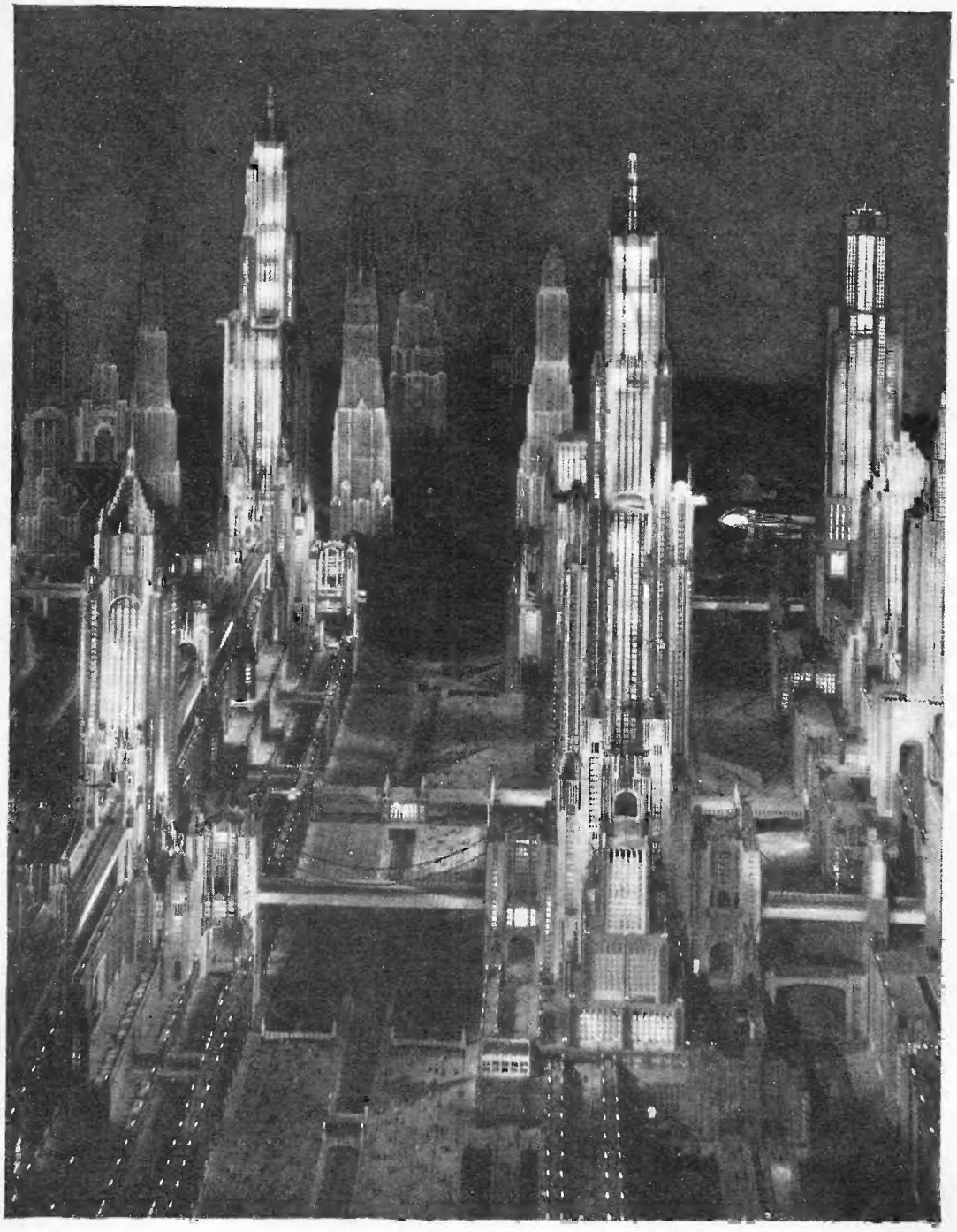
Address.....

City.....State.....

R. T. I. R. T. I. TRAINS YOU AT HOME FOR A GOOD JOB OR A PROFITABLE PART TIME OR FULL TIME BUSINESS OF YOUR OWN

www.americanradiohistory.com

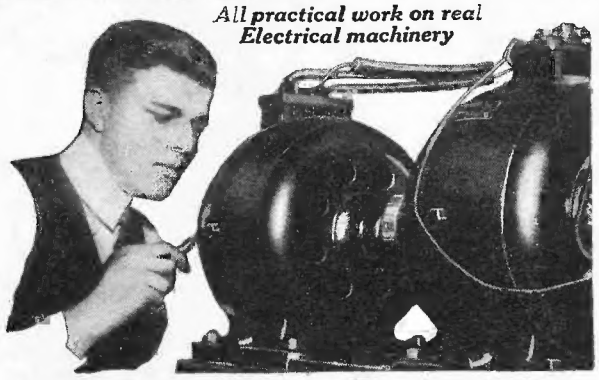
A Model City



In a new motion picture the set builders of Fox Movietone City erected a detailed miniature of New York as it may look in 1980 for use in the musical romance, "Just Imagine," by DeSylva, Brown and Henderson. Details of this model may be further gained by referring to the first article in this issue.

www.americanradiohistory.com

Get Into One Of These BIG PAY FIELDS



All practical work on real Electrical machinery

Amazingly Easy Way to Get Into ELECTRICITY

Don't spend your life waiting for $5 raises in a dull, hopeless job! Let me show you how to make up to $60, $70 and even $200 a week, in Electricity—NOT by CORRESPONDENCE, but by an amazing way to teach that makes you a **practical Expert** in 90 days!

Learn Without Books in 90 Days

No Books! No Lessons! You learn by doing actual electrical work right here in the Coyne Shops. You are trained on huge motors, generators, switchboards, transmitting stations, power plants, auto and airplane engines, etc. You don't need advanced education or previous experience. You qualify for real electrical work in 90 days!

Earn While You Learn

Don't worry about a job! You get FREE life-time Employment Service. And don't let lack of money stop you. If you need part-time work to help pay living expenses, I'll help you get it. Coyne is 31 years old. Coyne training is tested. You can find out everything FREE. Just mail coupon below and I'll send you my BIG FREE ELECTRICAL BOOK, telling all about jobs—salaries, etc. This does not obligate you. Just send the coupon below!

Student working on Television transmitter in Coyne Radio Shops

Learn RADIO TELEVISION TALKING PICTURES

Every branch of Radio is calling for trained men! 5,000 Service Men needed at once. Big call for Wireless Operators, both at Sea and in the Air. Many jobs open in Broadcasting Stations. Talking Picture and Sound Experts in great demand. And now Television is on the way! Soon there'll be a demand for thousands of Trained Men in this one branch alone.

Say "good-bye" to $25 and $35 a week—get into Radio, where thousands of jobs are open, paying $60 a week and up.

NOT BY CORRESPONDENCE

By Actual Work — in 8 Weeks

Come to Coyne and learn Radio in 8 weeks! NOT BY BOOKS OR CORRESPONDENCE, but by actual Radio work on actual Radio equipment—on scores of Radio receivers, huge Broadcasting equipment, the very latest Television transmitters, Code Practice apparatus, Talking Picture and Sound equipment, etc. No experience needed. You learn all branches of Radio in 8 weeks.

Free Employment Service

After you graduate, I'll help you get the Radio Job you want—and if you need part-time work while at school, I'll help you get that, too. Coyne has been training men since 1899. Let Coyne train you for a Big Pay Radio Job! Mail coupon below for a copy of my BIG FREE RADIO BOOK, telling all about Radio, Television, Talking Pictures, Wireless, etc. This costs you nothing. Just mail coupon below.

MAIL THIS COUPON FOR BIG FREE ELECTRICAL BOOK..

H. C. LEWIS, PRESIDENT
COYNE ELECTRICAL SCHOOL, Dept. 90-27
500 South Paulina Street, Chicago, Illinois

Gentlemen: Please send me your big Free Electrical Book with 151 illustrations. This does not obligate me.

Name .....

Address .....

City ..... *State* .....

MAIL THIS COUPON FOR BIG FREE RADIO AND TELEVISION BOOK

H. C. LEWIS, PRESIDENT
RADIO DIVISION, COYNE ELECTRICAL SCHOOL
500 S. Paulina St., Dept. 90-8C, Chicago, Ill.

Gentlemen: Send me your Big Free Radio Book and all details of your Special Introductory Offer. This does not obligate me in any way.

Name .....

Address .....

City ..... *State* .....

www.americanradiohistory.com

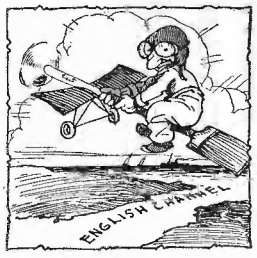
Safety Valve

This Department Is for Your Use. Expressions of Opinion or Comments Are Welcomed. Address: Safety Valve Editor

Doesn't Agree with Our Book Review Editor

YOUR Review of "Conquering the Air" on page 412 of the September issue of SCIENCE AND INVENTION calls for some comment.

No one belittles Colonel Lindbergh's remarkable and sporting achievement, but the hard fact remains that the first non-stop flight across the Atlantic was made eight years previously by Alcock and Brown.



Eight years is a long time in the history of modern aviation. Orville Wright flew 850 feet in 1903; less than six years later Bleriot flew across the English Channel; but anyone who attempted to decry the efforts of the Wrights because a much longer flight under much more difficult conditions had been made six years later would be accounted a fool and a knave.

Your childish and hysterical outburst can add nothing to Lindbergh's laurels, but it may well lead many to think that his fellow countrymen consider him unable to stand on his own merits and that he needs the efforts of the tub-thumper and mob-orator to boost him to fame.

W. E. L. BROWN,
Docwraies Manor,
Shepreth, Cambridgeshire,
England

(*We do not believe that in this review any attempt was made to detrimentally reflect on the remarkable flight of Alcock and Brown.*—EDITOR.)

Doesn't Like to Build Things

THERE is a great incongruity in your magazine which is a source of annoyance to me. The work done by the editor—The Way I See It, the answers to letters in The Safety Valve, and the editorials—as well as the work of the more reputable authors, is scientific in subject matter as well as in treatment. On the other hand, there is a great number of crude articles in every edition, which positively have no place in a magazine of your class. Some such articles are those on, Handy Hints for Mechanics; Furniture, New Household Articles such as Combination Secretary-Bookcase-Piano, or Portable Electric Fan, or Card Table Lamps; and How to Make a Boat from Old Inner Tubes. Such articles, although they are in the broadest sense of the word, inventions, find their proper place in farm journals, house and garden magazines, periodicals on handicraft, and the trade journals covering the particular subject.

I believe that the proper field for your magazine to cover is short descriptions of, and especially editorial comment on, the important features of current science and technology.

EUGENE F. COLEMAN,
Pittsburgh, Pa.

(*We will let some of our other readers comment.*—EDITOR.)

More Chemistry

I THINK your magazine SCIENCE AND INVENTION is one of the best and most interesting magazines of its kind printed. I like your articles on chemistry and it is for this reason that I purchase the book. If you would run more articles on chemistry I believe it would increase the sales of the magazine.

I have discussed your chemical experiments with others who are interested in the subject, and we have come to the conclusion that if in making the experiment you would describe some apparatus that an experimenter could make at home a great many more would enjoy them, because not everybody has the apparatus sometimes called for.

I for one agree with Mr. Josef Milota of Cleveland, Ohio. Let's have more chemistry.

A. JOSEPH ALESSI,
Chicago, Illinois

(*You will find a little more chemistry in this issue. We feel confident that future issues will contain still more of your pet subject.*—EDITOR.)

An Appreciation from England

A COPY of your recent SCIENCE AND INVENTION has come to hand and I feel I must congratulate you on such fine work. It represents to my mind a journal that contains modern comprehensive thought explained in a clear concise manner.

W. E. ROBERTS,
South Bermondsey,
London S.E. 16,
England

Few Suggested Improvements

YOUR magazine is fine but it could be better. I am not kicking and I don't represent everybody or have their opinions but I would like to offer a few suggestions.

Why not put all the advertisements in the front or back and leave the middle section for good honest-to-gosh science? Then if a fellow has a chance to have his magazines bound he can slice off the advertisements, and not have to fill his volumes with "How to Build up Your Muscles" or "How to be a Detective."

Why not publish a general index to, say, the issues of the last five years or so? Or beginning with the present volume, publish an index to the whole volume in the twelfth number?

I have issues of your magazine for about five years back. Many articles I know I have, and would like to refer to, but I certainly don't like turning the pages of say—sixty magazines to find them.

I like your articles on chemistry, experimental electricity, germs, poison substances, photography, etc. I wish you would put in more of them. Don't discontinue the Oracle.

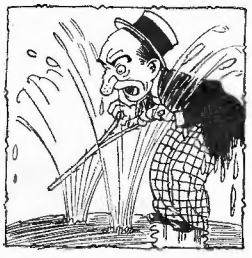
Of course, this is only my opinion. Yours is the best scientific publication on the market. It touches on many sciences, not specializing in any one. And again, if a fellow really wants more articles on one subject, he should buy a magazine which specializes in that one thing.

HENRY E. JACOB,
Portsmouth, Ohio

(*You will find the Oracle Department is back with us again. A general index for the year would mean devoting the entire publication to an index.*—EDITOR.)

The Divining Rod

THERE is prevalent in this and possibly other sections of our country, a tradition which with some of our people amounts to a belief in the Water Witch. You are undoubtedly familiar with this belief, for I believe it to be as firmly established in other parts of the country as in this locality. The accepted belief of the disciples of water witchery is that certain persons can, with the aid of a forked peach or willow switch held by the two ends of the fork so that the junction points perpendicularly, locate underground water to the complete success of the hopeful but otherwise chancing well-digger. There is confusion in the minds of these believers as to whether the pointing of the switch toward the earth when the witch passes over the hidden water is caused by a supernatural or by a scientific reason. At any rate, the custom of employing a witch to locate a new well site is almost universal in this place. To my mind the thing is such a laughable absurdity that it is not worthy of more than a casual interest and that, only from a traditional point of view. I, however, find certain people, otherwise normally intelligent, who believe sincerely in this amusing absurdity. I find also, although from a very modest reading and search, no refutation of this belief by scientists. They, no doubt, have rightly considered it not worthy of interest.



I, however, am wondering if your magazine could direct me to a denial of this nonsense from the accepted facts of science, and incidentally give me the pleasure of correcting a kink in the brains of certain of my otherwise normal friends. I naturally will be only too glad to bear any costs that may accrue.

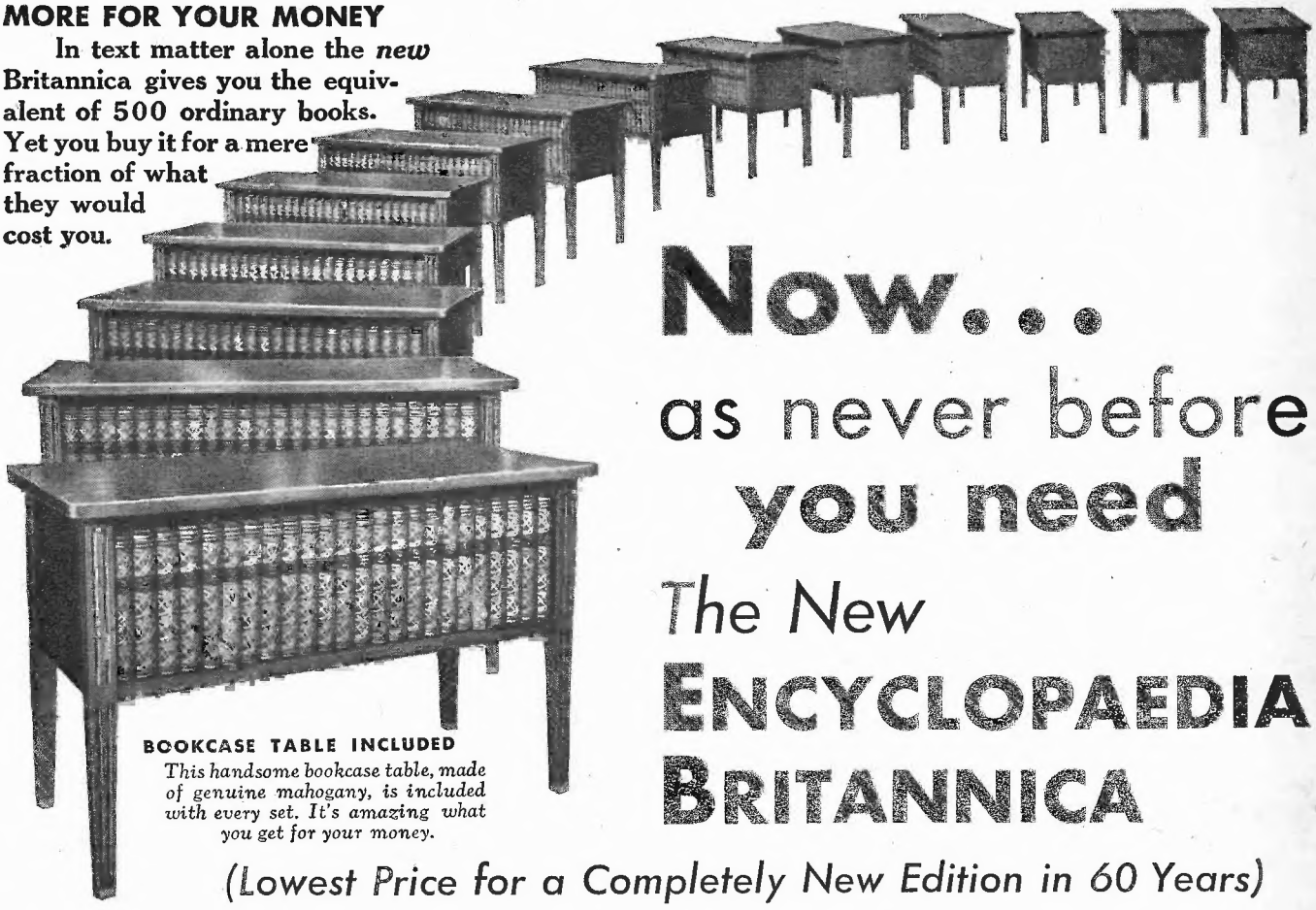
R. P. GANT,
Columbia, Tenn.

(*If you will refer to back issues of* SCIENCE AND INVENTION, *you will find that several articles on the subject of the Divining Rod have appeared. These show the absurdity of the belief. There are mechanical means that have been developed for the purpose of locating water, but they work on scientific principles not on the assumed powers of a forked branch of the witch-hazel tree. The Smithsonian Institute, Washington, W. C., has published an extensive report on the subject.*—EDITOR.)

www.americanradiohistory.com

MORE FOR YOUR MONEY

In text matter alone the *new* Britannica gives you the equivalent of 500 ordinary books. Yet you buy it for a mere fraction of what they would cost you.



BOOKCASE TABLE INCLUDED

This handsome bookcase table, made of genuine mahogany, is included with every set. It's amazing what you get for your money.

Now...
as never before you need
The New ENCYCLOPAEDIA BRITANNICA

(Lowest Price for a Completely New Edition in 60 Years)

"A NECESSITY IN EVERY HOME"—this is the verdict of critics everywhere. And there is no doubt about it. Here is one book every family needs.

We live in a new world today—fast-moving, complex. Now as never before you must equip yourself to meet new conditions . . . Now as never before you need the every-day help of this *new* Britannica. And you can buy it at an amazingly low price. Already 50,000 families own and are using this great work.

Greatest Knowledge Book of All Times

"IT would be quite impossible," says Frank B. Jewett, President of the Bell Telephone Laboratories, "to have even a casual familiarity with things daily discussed, were it not for the new edition of the Encyclopaedia Britannica."

Here, in 24 compact volumes, is the sum of everything under the sun—the whole story of human thought and achievement from every time and land. 500 other books could not give you the equivalent of this *new* Britannica. It's an amazing work—as authoritative as any text-book—yet as up-to-date, as human, as your favorite magazine.

Fascinating—Practical

YOU'LL never forget the first time you look into the *new* Britannica. 3,500 leading authorities of the day have written its articles. 15,000 new illustrations fill its vivid pages. Here is history, science, exploration, etc.—home-education that is sheer pleasure.

Knowledge was never more accessible. Nor was it ever more practical. You can really *use* the information you find in the *new* Britannica.

For Old and Young Alike
The Finest Christmas Gift

FOR the whole family there is no gift that can equal this amazing book.

Women use it constantly to keep up-to-the-minute on art, decoration, travel, costume designing, child management.

Men daily turn to it because it's so practical—because it gives them their facts quickly and accurately.

Children especially will profit by this book. It helps them in their school work, develops their individual interests.

"The subject matter is so alive," says MRS. FRANKLIN D. ROOSEVELT, *"that it holds a child's interest even to general exploration beyond the matter actually in hand."*

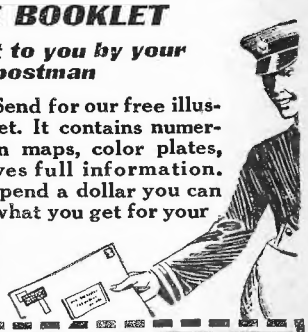
NEW LOW PRICE
Only $5 down

REMEMBER—it is not expensive. Consider that the Encyclopaedia Britannica is a *real investment*. It offers you amazing value—**at a new low price.**

You may buy it on easy payments. Under our Time Payment plan, an initial investment of only $5 is required to bring the entire set to your home.

56-PAGE FREE BOOKLET
Brought to you by your postman

Act now! Send for our free illustrated booklet. It contains numerous specimen maps, color plates, etc., and gives full information. Before you spend a dollar you can see exactly what you get for your money. Just fill out the coupon and mail today.



3 SI-JI3

ENCYCLOPAEDIA BRITANNICA, Inc.
342 Madison Avenue, New York City

WITHOUT OBLIGATION—

Please send me, by return mail, your 56-page illustrated booklet with color plates and maps from the *new* Britannica, together with low price offer, etc.

*Name*_____

*Address*_____

*City*_____ *State*_____

SEND FOR THIS FREE BOOKLET TODAY

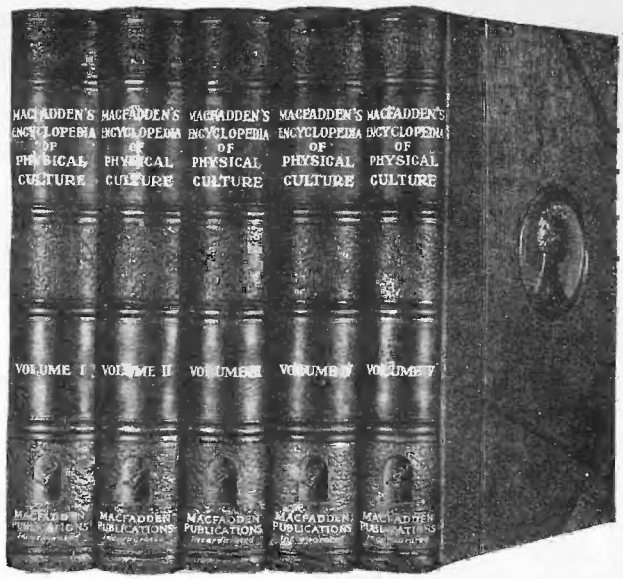
www.americanradiohistory.com

Will you be one of the 800,000 who will die this year of preventable disease?

OF the hundreds of thousands who die from respiratory diseases, bronchitis, pneumonia, kidney diseases, tuberculosis, influenza, and intestinal disorders, a large portion would not have died if they had been able to recognize early symptoms and had known how to treat themselves.

Nature always warns of impending sickness. The occasional headache, that tired, exhausted feeling, loss of appetite, a casual cold and other slight disarrangements are Nature's warnings to you that your body isn't functioning properly or that you are not living and eating correctly.

You can rule your health just as surely as you can rule your actions. If you are not enjoying perfect health today it is because you haven't enjoyed the method provided by Nature to keep you well. If you don't know what her requirements are, you are sure to blunder into some kind of sickness—perhaps fatal disease.



ENCYCLOPEDIA of PHYSICAL CULTURE
New 8th Edition ~ Completely Revised

EVERY year more than ten thousand people die of bronchitis, sixty-four thousand die of pneumonia, seventy-five thousand die of kidney trouble, fifty thousand die of respiratory disease, one hundred and six thousand die of tuberculosis, approximately eighty-five thousand die of influenza, and more than ten thousand die of intestinal trouble.

Barring accidents and suicides, only a small percentage of these thousands should die.

It is a fact that only about one person out of three enjoys good health. And those who are physically a little "Off" right now, will more than likely be the ones to succumb to preventable diseases this year. And they are the ones who should not die.

Nature is constantly warning you of impending sickness. Seemingly trivial symptoms tell of serious trouble taking root in your body. And yet, ninety-nine people out of every hundred will absolutely ignore these danger signals. As long as they are not flat on their backs, they will fool themselves into believing that they are all right.

Nature is merciless. If you do not understand her laws and her methods of preventing and curing sickness, you suffer. She knows no excuse—she accepts no apologies.

The Average Person Pays Thousands of Dollars in Doctors' Bills

Those who do not know Nature's methods of preventing and curing sickness are ill an average of 21½ days each year. In fact, it is estimated that the average person in a lifetime spends $4,100 on doctor and hospital bills, loss of time from business, medicine and other expenses due to illness. Thousands of people are living half-powered lives because they are ignorant of the laws of Nature. Many of these people will fill an early grave, when they might easily have lived to enjoy a ripe old age.

What would it be worth to you to be able to instantly identify in its earliest stages any sickness or disease that might overtake you or any member of your family? To enjoy perfect health, almost complete freedom from sickness, doctor and hospital bills, and no days of suffering and worry, or salary lost through sickness?

How to—

possess exhilarating health every day in the year
know your own body
eat for health
diet for the cure of disease
know the art of food preparation
build a powerful physique
correct physical imperfections
become a physical director
avoid unhappy marriages
avoid disease
fast as a curative measure
cure by hydropathy (heal by the use of water)
apply all methods of drugless healing
give first aid in emergencies
apply home treatment for disease
recognize diseases by manifestations
build nervous energy
treat the common form of disease
understand the process of reproduction
benefit by laws of sex and marriage
treat diseases of women
diagnose diseases
have healthy and vigorous children
treat female disorders
treat male disorders
obtain virility and manhood
care for the complexion
manicure; care for the hair and feet
cultivate the mind—

These are only a few of the matters explained in the Encyclopedia.

The Encyclopedia of Physical Culture

(8th Edition—Greater Than Ever Before)

This marvelous 5-volume work gives you the information you need to build up rugged strength, health and vitality. It is for every member of the family—it covers every phase of strength and body building for adults, children and babies. It gives invaluable information on fasting, dieting and exercise. A thorough and extensive treatment is given of the laws of sex, the attainment of virile manhood and womanhood, and happy, successful parenthood, together with details for diagnosis and treatment of all sexual diseases. Handsomely illustrated charts on anatomy and physiology are scattered throughout the book.

It is neither dull nor technical, but is simple, comprehensive and complete in every sense. It is the crowning effort of Bernarr Macfadden's rich, full experience in the science of health and physical culture. He has had more than thirty years' experience in guiding thousands of physical wrecks to glorious health and vigor. Out of that experience he built his Encyclopedia of Physical Culture.

Seven big editions of this popular work have been exhausted. And now the eighth edition—greatest of all—has just come off the press. This edition has been completely revised at great expense. Scores of new illustrations have been inserted. The binding has been changed to a beautiful all Fabrikoid, more durable than leather. Altogether it is the finest edition of the Encyclopedia ever issued.

10 Days' Free Examination of Entire Set—No Money Needed

This is the most liberal offer we have ever made on the Encyclopedia—10 days' examination of the entire set at no expense to you. There is no money needed—no deposit to pay. Just fill in the coupon and we will send the five volumes to you, all shipping charges prepaid, for your inspection.

Take ten days to examine the set. Then, if you decide to purchase, send us only $2.00 as your first payment. Additional payments may be made at the rate of only $3.00 a month until the total cost of $35.00 has been paid.

If you care to pay cash you may do so by sending us only $31.50. This represents a 10 per cent discount.

If you purchase the set at once we will include, without extra charge, a one year's subscription to PHYSICAL CULTURE Magazine.

Remember, no money now, and no obligation to purchase. You simply agree to return the books at the end of ten days in case you decide not to keep them.

An increase in price is planned. This increase will be substantial and will be announced within a short time. So, it is suggested that all who wish to take advantage of the present low price, order their sets before the increase takes place.

Macfadden Book Company, Inc.
Dept. SI-12, Macfadden Building,
1926 Broadway, New York City.

SPECIAL

Send me on 10 days' inspection the five volumes of the Encyclopedia of Physical Culture. If I find the set satisfactory I will either send $2.00 in ten days and $3.00 a month until $35.00 has been paid, or $31.50 cash. If I decide not to keep the books I will return them in 10 days postpaid.

Foreign orders—cash in advance.

Name.....

Occupation.....

Residence.....

Employed at.....

Business Address.....

I understand that this price includes a subscription to Physical Culture Magazine for one year.

www.americanradiohistory.com

RADIO'S Latest and Greatest

Get This 168 Page Catalog

EVERYTHING AT LOWEST WHOLESALE PRICES!

You Never Saw SUCH VALUES!

On every page of this remarkable Book of Bargains you will find items of interest—over 500 illustrations of the latest features in Radio receivers and equipment—sets, accessories, parts and kits.

Newest Improvements

All the 1931 marvels of Radioland—1931 Screen Grid, Tone Control, A.C. Humless All-Electric Sets, Mantle Sets, Public Address, Phono-Combinations, Dynamic Speakers, Beautiful Consoles—as well as battery operated sets. Also the brand new Slot Machine Radio—a big money-maker for restaurants, hotels, stores and public places.

A Slaughter of Prices

Old price standards are slashed to smithereens in our new quotations. The finest merchandise that skill can device at lowest wholesale prices. We save you big money on any radio need.

At no time since the science of RADIO startled the world have you been able to secure such astounding values as the new Allied catalog brings you.

If you contemplate buying either a complete set or any single article of radio equipment, it will mean money in your pocket to have this 1931 book of wonderful radio values before you.

Our Buying Power

alone brings you these amazing values. With resources of over three million dollars, we maintain an enviable position in the buying market. You reap the benefit.

Catalog is FREE

Every buyer of radio merchandise should have this catalog, with its myriad of money-saving features. Send for it today.

ALLIED RADIO CORPORATION

711 W. Lake St. Dept. D-3, Chicago

You Pay Only $48.25 for this $110.00 VALUE

www.americanradiohistory.com

DECEMBER, 1930
WHOLE NO. 212

Science and Invention

NUMBER 8
VOLUME XVIII

Published by Radio-Science Publications, Inc., 381 Fourth Ave., New York City, N. Y.
B. A. MACKINNON and H. K. FLY, Publishers

JOSEPH H. KRAUS, Editor

A. DINSDALE
Managing Editor

T. O'CONOR SLOANE, Ph.D.
Associate Editor

MARY JACOBS
Feature Editor

DR. DONALD H. MENZEL
Astro-pnysics Editor

AUGUSTUS POST
Aviation Editor

J. PHILLIPS DYKES
Marine Editor

DR. E. BADE
Biology Editor

Editorial

When Scientists Foregather

The British Association Meeting

IN the Fall, some of the various national scientific associations of the world hold their annual meetings. There the wise men of the earth foregather, and the press of the world endeavors to report adequately such of the proceedings as are capable of being rendered in intelligible English.

Dr. H. S. Harrison, President of the Anthropological Section of the British Association for the Advancement of Science, insisted, without intending to minimize the achievements of the Mayas, the Incas and the North American Indians, that the past glories of their civilizations did not develop independently, but had their roots in long-forgotten civilizations of the Old World. He averred that the culture and inventions of mankind are developed as definite reactions to surrounding circumstances, and are spread by diffusion from the centers in which they arose. How the diffusion takes place is not clear from the report.

Dr. P. M. Dirac, a young Cambridge physicist, propounded a new atomic theory which was supported by no less an authority than Sir Oliver Lodge. Up till now all matter has been taken as being composed of two elementary kinds of particles, electrons and protons, but Dr. Dirac suggests that there is but one elementary kind of particle in nature.

American National Academy of Sciences

PROFESSOR ERNEST O. LAWRENCE, of the University of California, addressing the National Academy of Sciences at Berkeley, Calif., described a new apparatus intended to speed up atoms of hydrogen to 37,000 miles per second in an effort to attain that long-sought goal, the splitting of the atom. Velocities equivalent to that produced by a million volts are ordinarily required before atomic battering can commence, but Prof. Lawrence's apparatus achieves the necessary atomic velocity with a potential of only 10,000 volts.

Dr. J. H. Moore, of Lick Observatory, told the Academy that the length of the Neptunian day is sixteen hours.

American Astronomical Society

DR. PIET VAN DE KAMP, of the Leander McCormick Observatory, University of Virginia, told the Astronomical Society that the universe may be hundreds of quadrillions of miles smaller in size, and distant stars thousands of light years nearer to us than science now supposes. He bases this claim on observations which appear to indicate that there is something—as yet unclassified—in outer space which absorbs the shorter wavelengths of light. In other words, stars appear to be redder than they really are, and also much further away. Present calculations are based on the assumption that interstellar space is transparent, and that light leaving a star reaches us in an uninterfered with condition. Dr. Van De Kamp's findings are supported by independent observations made by Dr. P. J. Trumpler, of the Lick Observatory.

Italian Society Meeting

DURING the course of his inaugural address to the annual meeting of the Italian Society for the Advancement of Science, the Marchese Guglielmo Marconi, inventor of wireless telegraphy, expressed his belief that radio waves may travel millions of miles beyond the atmospheric layer of the earth before they are reflected back to earth again by something—we know not exactly what. At about the same time, Professor E. V. Appleton, of the University of London, told the British Association a similar story. The theory is goue into at greater length elsewhere in this issue. The news that the theory is practically a demonstrable fact opens up for further speculation the possibility of communicating with Mars and other neighboring planets upon which some form of intelligent beings may possibly exist.

Italy has honored her most famous scientist by electing Marchese Marconi to the Presidency of the Italian Academy.

A. Dinsdale

"Those Who Refuse to Go Beyond Fact Rarely Get as Far as Fact" - - - - - - - - HUXLEY

www.americanradiohistory.com

5 days

to try the car you buy

THE famous Studebaker Pledge grants you this privilege to guarantee your satisfaction—drive the used car you buy *five days* before you decide. If you are not satisfied, you may return the car and apply your payment on *any* car in your Studebaker dealer's stock—new or used.

In addition to this five-day driving trial, the Studebaker Pledge further protects you by placing a 30-day guarantee on all Certified cars—and by insisting that all Pledge-backed cars carry their lowest prices in plain figures.

The people who have bought hundreds of thousands of Pledge-backed cars from Studebaker dealers were "sold" on the honesty and fairness of this Studebaker used car sales policy. You can have this same assurance of satisfaction with *your* used car purchase if you, too, buy under the terms of the famous Studebaker Pledge. See your Studebaker dealer first—you will avoid future regrets.

Pledge to the Public on Used Car Sales

1 Every used car is conspicuously marked with its lowest price in plain figures, and that price, just as the price of our new cars, is rigidly maintained.

2 All Studebaker automobiles which are sold as CERTIFIED CARS have been properly reconditioned, and carry a 30-day guarantee for replacement of defective parts and free service on adjustments.

3 Every purchaser of a used car may drive it for five days, and then, if not satisfied for any reason, turn it back and apply the money paid as a credit on the purchase of any other car in stock—new or used. (It is assumed that the car has not been damaged in the meantime.)

© 1928 The Studebaker Corporation of America

INVEST 2¢ . . . You May Save $200

Spend 2c now for your copy of this interesting and instructive booklet, "How to Judge a Used Car"—it may save you as much as $200 on the used car you buy. Mail the coupon now!

THE STUDEBAKER CORPORATION OF AMERICA
Div. 1712, South Bend, Indiana

Please send me copy of "How to Judge a Used Car."

Name.....

Street.....

City..... *State*.....

Studebaker

Builder of Champions

www.americanradiohistory.com

Actual PUMP INSPECTION *Safeguards* ETHYL quality

Ethyl inspector purchasing actual sample of Ethyl Gasoline *from the pump*. In Ethyl laboratories this sample must meet all Ethyl requirements.

MAYBE you've seen these inspectors, driving cars like this, stopping at Ethyl pumps, buying a gallon here and a gallon there. They are Ethyl representatives—making sure that all gasoline sold under the Ethyl emblem has the full extra quality of Ethyl Gasoline.

Each one of these cans is sealed and marked at the filling station and sent to Ethyl laboratories for testing.

The 76 oil refining companies that mix Ethyl fluid with their gasoline cooperate by authorizing these tests so all Ethyl Gasoline will meet the standard you have learned to expect.

Before any gasoline is mixed with Ethyl fluid at the refineries, a sample is sent to an Ethyl laboratory. A test shows how much Ethyl fluid is needed to bring it up to the standard of Ethyl Gasoline. At least this much Ethyl fluid is then added. After the mixing, a sample of the finished Ethyl Gasoline is sent for testing.

But even this is not enough. To make sure Ethyl Gasoline reaches you with quality unchanged, inspectors take samples from Ethyl pumps throughout the country.

So you are triply protected when you buy at the pump that bears the Ethyl emblem. Its standard of quality is never lowered. Ethyl Gasoline Corporation, Chrysler Building, New York City.

ETHYL
BRAND OF ANTI-KNOCK COMPOUND
ETHYL GASOLINE CORPORATION
NEW YORK, U.S.A.
Knocks out that knock

Wherever you drive—whatever the oil company's name or brand associated with it—*any* pump bearing the Ethyl emblem represents quality gasoline of high anti-knock rating.

The active ingredient used in Ethyl fluid is lead

© E. G. C. 1930

ETHYL GASOLINE

www.americanradiohistory.com

DECEMBER, 1930
WHOLE NO. 212

Science and Invention

VOLUME XVIII
NUMBER 8

Movie Portrays City of the Future

By Edwin Schallert

BUILDINGS 250 stories high—nine different levels for traffic arteries—canals for ships running under the tallest skyscrapers—chutes for airplane landings in the upper stories thereof — no grade crossings in an entire city—dirigibles flocking overhead from trans-Atlantic voyages — a rocket plane *en route* to Mars—television — food in capsules—liquor in the shape of pills—

This is the world of 1980 as visualized by the movies. More specifically it is the City of New York fifty years from now as projected on the screen in the Fox production, "Just Imagine," a romantic musical play dealing with the happenings far in the future, and one of the year's biggest film novelties.

By building an elaborate miniature model of a city in a dirigible hangar, various different angular views were obtainable by the cameramen. This photograph differs primarily from the one shown on the frontispiece in this issue, in that it was taken closer to the street level.

The new cinema has called on the imaginative resources not only of the scenario writer, but of the technical department, as the effort has been made to provide a scientific background for most of the fantastic events that transpire in the plot of the production. Through the medium of camera illusion, the picture makers have been able to create a dream world that goes to the limits of prophetic fancy.

The "Manhattan of Fifty Years from Now" is a particularly clever accomplishment, and in that locale as well as on the planet Mars, not to speak of the ethereal spaces between, eventuates most of the story. The New York setting was, however, worked out in the most remarkable detail, and reveals on the film an overwhelming grandeur in its architecture, as well as amazing innovations in traffic management. A perspective of the city is shown in the photos and diagram.

Virtually all forms of transportation in this new metropolis are to be found at one's doorstep. Especially is this true of the city's skyscrapers, under which run canals for ships, subways for trains, and even auto highways. There are pedestrian lanes, huge boulevards, and roads for auto freight

www.americanradiohistory.com

A remarkable example of the superimposing method of photography is here illustrated. The background of clouds was first photographed and an orange print was made of the view. The airplane was then "shot" separately against the blue background, while the orange colored film was inserted in the camera as a photographic filter.

that lined the traffic arteries. Artificial fog and rain were sprayed over the set, all adding to its naturalness and reality.

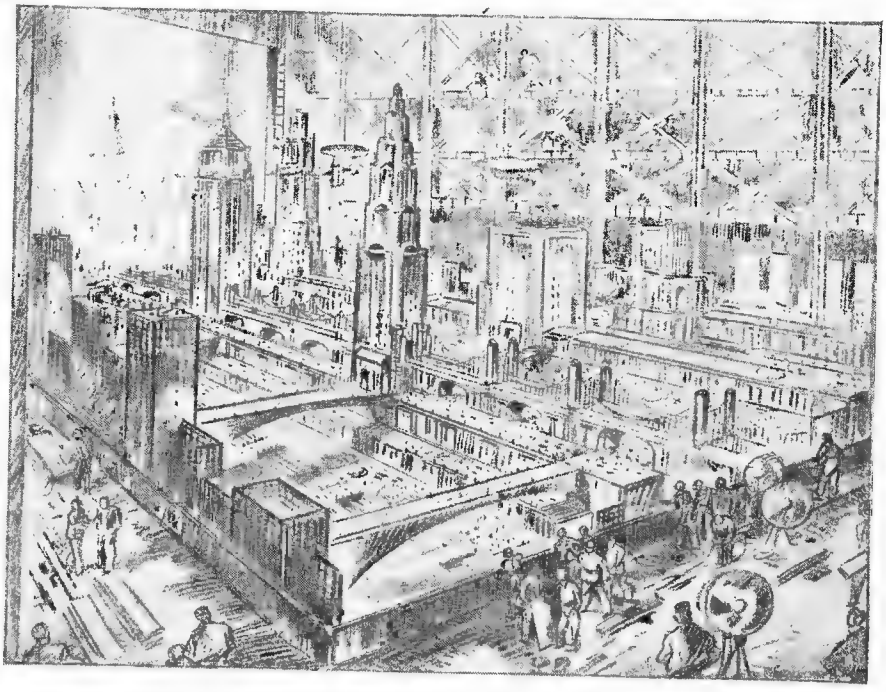
A variety of camera angles was provided, some from the level of the streets, as shown in the sketch (sent separately) and others (as if from an airship) taken from the balconies arranged at various levels in the dirigible hangar where the miniature was housed.

The voyage to the planet Mars which is incorporated in the picture assumes a highly imaginative character. This comes as the climax when the aviator hero, bent on winning the heroine, undertakes this (*Continued on page 735*)

travel. The voyager across the ocean may embark on a vessel from his own office building, or he may secure air transportation, if he wishes from one of the upper stories of the structures. Convenience, comfort and speed are the watchwords of this futuristic metropolis.

The entire setting for this scene was built in minature model form at Los Angeles. It was probably one of the largest miniatures ever constructed for pictures. The length of the model was 225 feet and the width seventy, the entire construction being housed in a dirigible hangar.

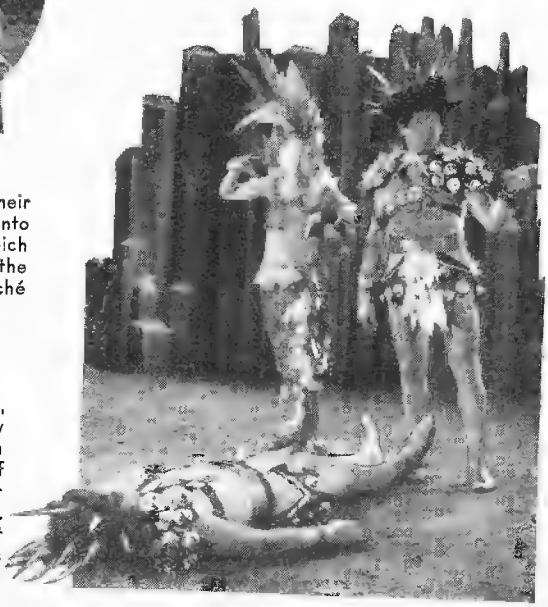
In such detail was the construction carried out that the services of more than 200 persons were required for the work over a period of more than a month. The buildings were towering structures even in model form, and were brilliantly illuminated. Dozens of airplanes navigated the space above the skyscrapers, being operated by pulleys attached to windlasses. A number of dirigibles were animated in a similar manner. The autos, the vessels in the canal and the trains also moved, so that a living impression was gained of the whole. Tiny street lamps with bulbs of less than one candlepower were affixed to the little poles



More than 200 people worked for longer than a month to construct buildings that were towering structures even in miniature or model form. Here is a drawing of the city as it was laid out in a dirigible hangar. The length of the model was 225 feet and width was 70 feet. It was undoubtedly one of the largest miniatures that was ever constructed for motion picture work. Dirigibles and airplanes navigated the space above the skyscrapers, being remotely controlled from galleries on either side.

The rocket plane in which aviators made their movie flight to Mars. This plane was raised into a vertical position by hydraulic lifts after which the flight of the plane from the earth to the distant planet was depicted with papier-mâché miniatures.

An idea of the detail with which the model was built can be obtained in this picture. Street lamps of less than a candle power each were affixed to the little poles that lined the streets.



According to the story, Mars is inhabited by twins. One of them acts from motives of good and the other from motives of evil. Here the Martian giant Boko (bad) kills his twin Loko (good).

www.americanradiohistory.com

Plant Your Bulbs Now

By Dr. E. Bade

Lilium Longiflorum, or long-leaved lily.

SOME of the most charming of all garden and potted plants are to be found among the bulbs and tubers. It is their representatives which tell us

Scilla Sibirica, or snowdrop

that spring is here, and it is to them that we turn when we desire to have flowers in the window-garden in winter when snow and ice cover all outdoors.

The majority of them are natives of those regions whose climate forces them to undergo a periodic rest. It is during this unfavorable time that the plant continues to live under ground, the reserve supply of food and vitality being stored in a special underground growth known as a bulb. The leaves have died off and the entire plant is resting, waiting for a favorable condition to grow. At this time adverse climatic conditions leave them unaffected.

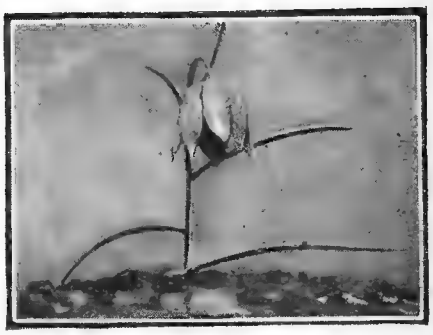
Muscari Botryodes, or grape hyacinth.

As a rule hardy bulbs do best in a soil which is not too heavy, which retains its moisture and which does not heat too much. This means that too much sand should not be present, and that the soil should not cake. The beds themselves should be slightly above the surrounding ground so that drainage is rapid. The southern exposure of the beds should be protected from the cold north winds. The best time for planting hardy bulbs is in the fall. Early spring planting is useless, for no advantageous results may be expected. The correct time for planting is about six weeks before frost occurs in the vicinity in which one lives. The planted bulb should not develop a shoot or begin to grow before the expiration of the year that it is placed in the soil. It should just produce its root system and this it does because the surface of the soil is cold and discourages leaf formation, but the soil below is still warm and aids root development.

Parrot Tulip.

Cool weather prevents the growth of the leaf and floral shaft which would, under normal conditions, appear about five weeks after planting. This period of time is far too short for the thorough formation of roots, and all of the reserve food supply stored within the bulb is used up in the growth above the ground. Since the inadequate roots are unable to supply all the foods necessary for growth, all the reserve is used up and the bulb dies. It is for this reason that bulbs should never be planted too early.

Iris Hispanica, or Spanish Iris.



Fritillaria Meleagris.

Wherever it is necessary to fertilize the garden only old, well rotted cow manure should be used, and as much of it as desired may be mixed in with the soil. This forms a light, rich soil which is especially demanded by the hardy bulbs.

Never place the hardy bulbs at a shallow depth. The frost and thaw will only raise them, pulling the root system from the bulb with the result that but few flowers are formed. Tulips, Hyacinth, Narcissus, etc. should be planted to a depth of at least 5 inches. Smaller bulbs of other forms are, naturally, planted closer to the surface.

It is well to cover the beds, after the first strong night frost, with short straw, fallen leaves or conifer twigs. This material should not be left untouched until (*Continued on page 742*)

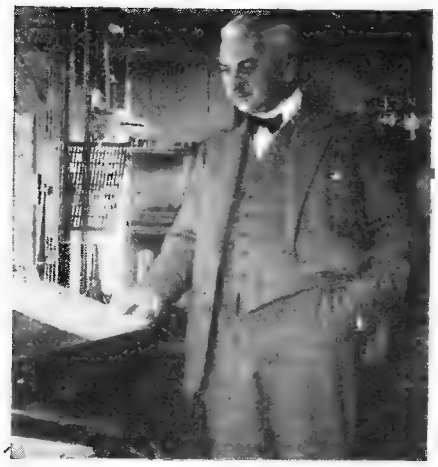
Galanthus Nivalis, or double snowdrop.

www.americanradiohistory.com

Holes that Keep Out the Wind

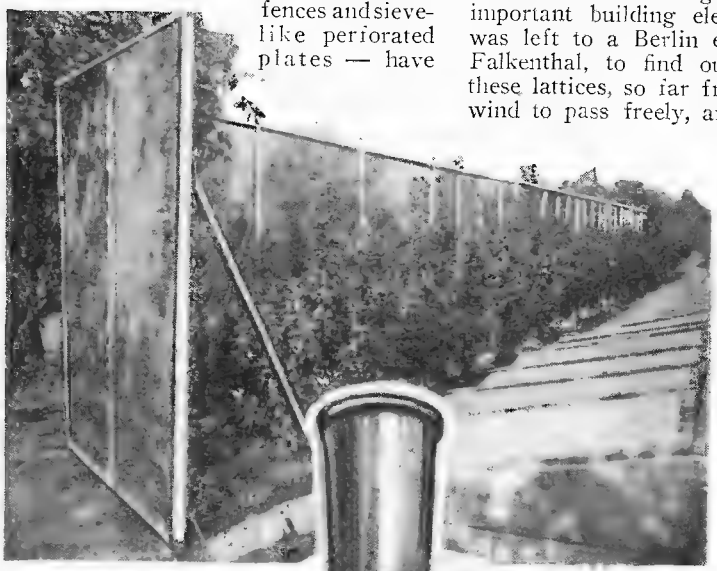
By Dr. Alfred Gradenwitz

If You Wanted to Erect a Wind-Proof Screen to Protect, Say, Some Delicate Plants, You Would Naturally Make It Solid, and Probably Build It of Wood. And the Result Would Probably Be Unsightly and Shut Out the View. From Germany Comes the Somewhat Startling News That a Type of Lattice Has Been Developed Which Overcomes These Disadvantages and at the Same Time Acts as an Efficient Wind Shield



Mr. E. Falkenthal discoverer of the new physical phenomenon described in this article.

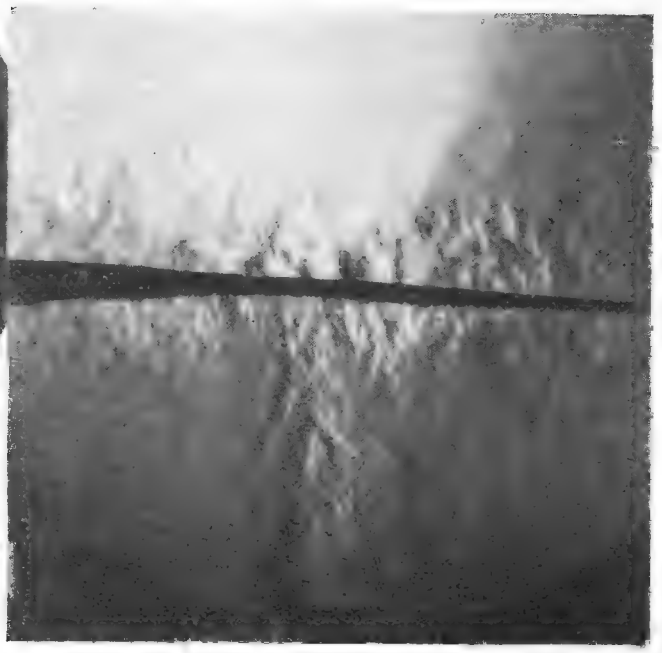
LATTICE-WORK and gratings of many types — wire-mesh lattice, wicker-work, flat wooden bar fences and sieve-like perforated plates — have been used since time immemorial. Modern engineering has for some time been using them on an ever-increasing scale, iron framework being one of its most important building elements. Still, it was left to a Berlin engineer, Mr. E. Falkenthal, to find out that some of these lattices, so far from allowing the wind to pass freely, are so impervious to rapidly moving air as to be practically wind-proof.



Lattice screen protecting plants.

I recently had the good fortune to witness a special demonstration of this startling discovery. A hot air blower, or "Föhn" was driving a strong current of air against all sorts of objects which were to be examined. If a piece of round wire lattice-work was inserted in the path of the wind, there was hardly any stopping effect to be noticed, the wind, as read from the anemometer, passing practically unhampered. If, on the other hand, a piece of flat-bar lattice-work was substituted, the air current would be checked almost completely, there being only some sort of turbulence immediately behind the lattice; the action of the screen was practically identical with that of a closed surface. The stopping effect has been found to commence with air velocities of about 3 metres and to exist unaltered even with such a high velocity as 300 metres per second.

However, this strange phenomenon, as already stated, only occurs with flat lattice-work; moreover, the openings should be distributed uniformly over its surface, and the walls of the lattice should be thin, with sharp edges. Another important point is that the air striking the lattice should not itself be turbulent. The best effect is noted with bars of width equal to that of the interstices; there is, both with smaller and larger openings, (*Cont'd on page* 749)



Above—Flue dust separator for locomotives, designed on the new principle. Right—A photographic record of the air vortex formed behind a flat-bar lattice-work.

www.americanradiohistory.com

Why Are Circus Freaks

By Frederic Damrau, M.D.

A study in opposites: The Giant, the Fat Lady, and the Midgets enjoying the surf at Coney Island.

ONE of Nature's jokes on mankind is to develop human freaks. We are in the habit of placing these unfortunates in museums and sideshows, but few people who pay the price of admission ever stop to consider what makes them different from themselves.

There is a popular superstition that the unborn child may become a freak if the mother suffers from a severe fright or equally strong mental impression before the child is born. I have heard pregnant women adjured not to look at horses, lest the baby be marked with equine characteristics. All of these beliefs are without scientific foundation.

The truth is that no one cause can explain why a human being is born or becomes a freak. The cause that brings about Siamese twins, for example, is entirely different from that which produces a giant.

Midgets and giants are among the most interesting figures in the museum. Since childhood they have always excited our imagination. Who has not read with delight of the Lilliputians in *Gulliver's Travels,* or of the huge ogre in *Jack and the Bean Stalk?*

The Lilliputians, who were reputed to be only 6 inches in height and so small that they could stand on Gulliver's hand, were of course mythical. But all of us have seen real pygmies measuring 3 feet or less.

Queen Mary I, of England, had a page, John Jarvis, who was only 2 feet tall. At a dinner given to King Charles I, a huge pie was brought in and set on the center of the table. To the astonishment of the guests, out stepped a tiny human being—only 18 inches in height! He was Jeffery Hudson, who some years later killed a full-sized man in a duel.

When the mind abjures pain, the body does not feel it. Most of us can lessen the intensity of pain by will power, but few can deny it altogether.

The Bearded Lady with her normal daughter.

General Tom Thumb (Charles Stratton) was the most famous midget of the nineteenth century. At twenty-five he was only 31 inches tall. He had a keen intellect and delighted many an audience with his brilliant repartee.

The true midget is perfectly proportioned in every way. He is a miniature human being. He must be distinguished from other types of dwarfs: those with sawed-off, disproportioned limbs, and the cretins, those stupid looking creatures who fail to grow because of a lack of iodine in their diet, or when the thyroid gland fails to develop.

The stunted growth of midgets is believed to result from a failure of development of all the glands of internal secretion in the body. The adult remains a child in body, although the intellect develops to maturity as in the full-sized person.

Standing alongside the midget, in exhibitions, to accentuate the difference in size, we usually see a giant. He may be almost 9 feet tall, or even taller. Contrary to the general impression, the giant is not strong for his size. He is inclined to be muscularly weak and likely to die young. Intellectually, he is below par. In a game of chess between a midget and a giant, I should wager on the midget every time.

A tiny gland located in a bony compartment in the center of the skull—the pituitary gland—accounts for the condition of the giant. This gland controls the growth of the bones. If it becomes overactive before adult age is reached, the bones develop in length beyond normal proportions; also, the knob-like parts of the bones enlarge enormously, accounting for the huge knuckles and facial prominences of the giant.

A defect of the pituitary gland may be responsible for another circus freak, the mountain of fat who tips the scales at 400 or 500 pounds. No amount of dieting will reduce this buxom creature. When the pituitary gland falls down on its job, as in this exaggerated type of obesity, it simply is one's nature to be fat. On the other hand, most plump people not of the circus freak class are overweight because they nourish themselves too well and exercise too little.

People born without limbs, or with mere stumps, always arouse our compassion. The remarkable thing is how well they learn to compensate for their inferiority. In a tennis tournament a few years ago, I met a one-armed player. At the beginning of the match, I was inclined to feel sorry for him and placed the balls so as not to extend him too much. It was not long, however, before I (*Continued on page* 753)

www.americanradiohistory.com

Will America Olive Oil

By Count A.

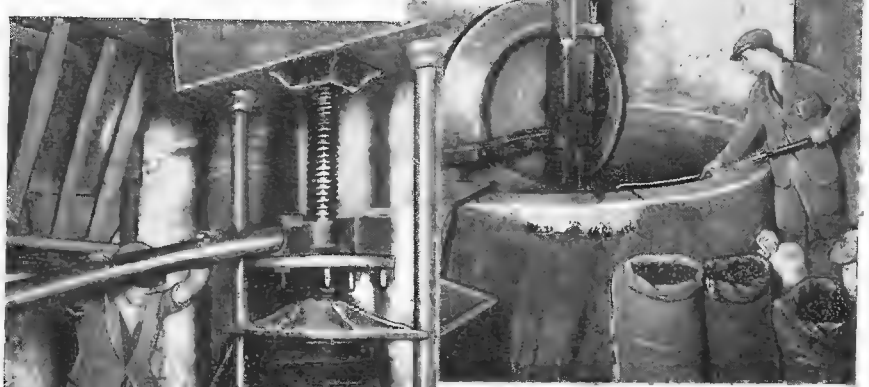
A fresh olive branch, and a dish of ripe olives.

WHEN olives and olive oil are mentioned, most people immediately think of the Mediterranean countries, especially Italy. Few realize that we have a young but vigorous olive oil industry of our own.

THE initial growth of the olive tree dates back so far that it still remains somewhat of a mystery. The most authentic data available informs us that the tree was first cultivated in the table lands of southern Asia by the Indo-Greek progenitors of the Greeks and Romans. Then came the seafaring Phœnicians who carried the olive to Egypt and Carthage. From these countries it was taken to Spain and the Mediterranean regions. In the Bible, we have reference to the olive branch which the dove of Noah's Ark brought back to indicate the recession of the flood. In Homer's "Iliad" and "Odyssey" we have reference to the olive tree as the "peace-bringing" tree. The Greeks of Athens ascribed its production to their Deity of the soil. The olive trees on the Acropolis were looked upon as the most sacred of all bearers of peace and good fortune.

The oil of the olive was used in the lamps of the temples in Biblical times. Without lamps lighted by olive oil no services could be held.

Such was the history and importance of the olive tree when it was first brought to the New World by the Jesuit Missionaries when they settled here in 1796.



Above—A glade of ancient olive trees in Provence, southern France. Right—Olive crusher in a 400-year-old southern Italian refinery.

Above—A primitive olive press in southern Italy, where third grade olives are used for making oil.

Left—Primitive refinery in southern France, where the oil is cleaned and graded.

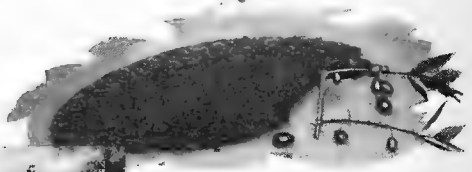
Through all their hardships they bore the plant and when they finally settled in San Diego, California, they planted the saplings. To them the oil of the olive was indispensable. Out of this one tree planted by the Jesuit fathers has grown an ever-increasing industry which today competes with many Mediterranean countries and which offers strong competition to the foreign leaders in this particular field of agriculture.

The tree can be grown with safety between the 34th and 44th parallels. In the New World, the olive-belt lies in upper Mexico, lower California, and the irrigated portions of Arizona. California is the most fruitful. The reasons for this are: (1) its early start, (2) its

www.americanradiohistory.com

Capture World's Market?

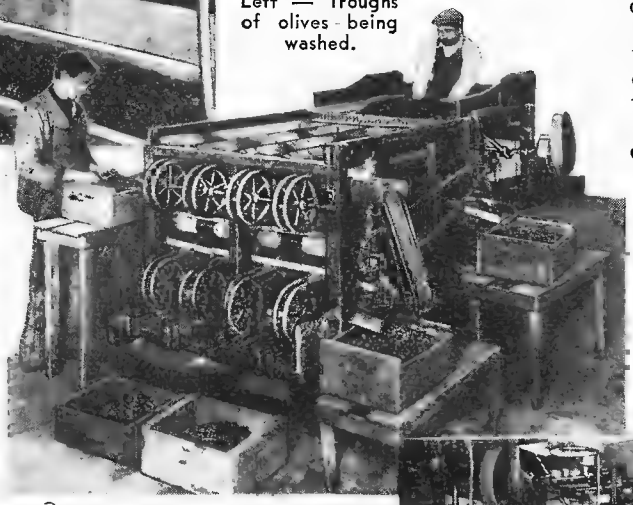
N. Mirzaoff

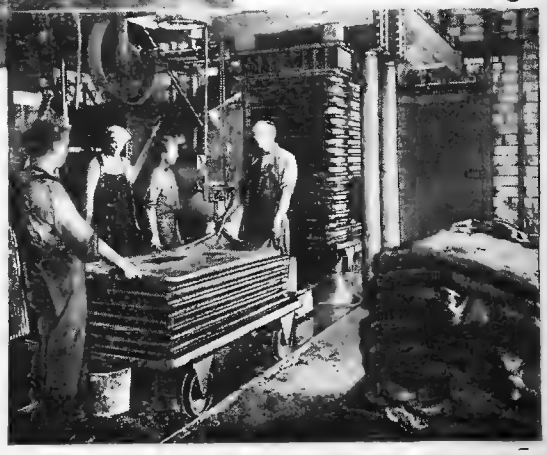


The remains of pressed olives, which are used for the manufacture of soap.

OUR left-hand picture spread illustrates European methods in the industry. The right-hand pictures illustrate olive oil manufacturing processes as carried out in up-to-date fashion in the United States. The contrast is obvious.

Above—Picking olives in southern California. The olives are ready for picking if they fall off the tree when the branches are shaken. Falling olives land on the ground sheet.
Left — Troughs of olives being washed.





The modern aspects of the plant and processes shown in the pictures on this page make an interesting contrast to the primitiveness visible in the photographs opposite.

Above—After washing, the olives pass through this machine which automatically separates them out into different grades.

Right—After a preliminary crushing in a mill, the olives are wrapped in burlap, laid in layers separated by steel grids, and put in a powerful hydraulic press which extracts the remaining oil.

suitable climatic conditions, (3) a wide research now being carried on under Federal and State supervision. Thus we can see that there are hopeful possibilities that California will supply the entire United States with the much needed olive oil.

There are three hundred varieties of olives, including the wild olive. However, of all these only one branch is extensively cultivated, this is the "Olea Europa."

The olive tree grows very slowly from the seed. According to experts some species have borne fruit for nineteen centuries.

Raising from the seed is used when new varieties or stocks for grafting are wanted. The yield of a crop grown by this method is usually smaller while of a more delicate and finer flavor. It takes twenty years for the tree, grown from the seed, to reach maturity. Today, however, the planting of suckers and cuttings is used as more practical. In the United States, branches from one to one and a half inches in diameter, and twelve to fifteen inches in length are used as cuttings.

The diseases most deadly to the plant originate from the lack of pruning of the tree. These are the "black smut" and its predecessor the "black scale," which eat away the bark of the trees. The "olive knot," which is of the same type of disease as the "black scale," is even more devastating than the former in its deadly effect on the tree. Happily, the "olive fly" which feeds on the fruit of the tree has not yet entered the United States but it is prevalent in the olive-growing countries of Europe. A careful inspection of imported olives is in constant operation, so that the pest may be avoided.

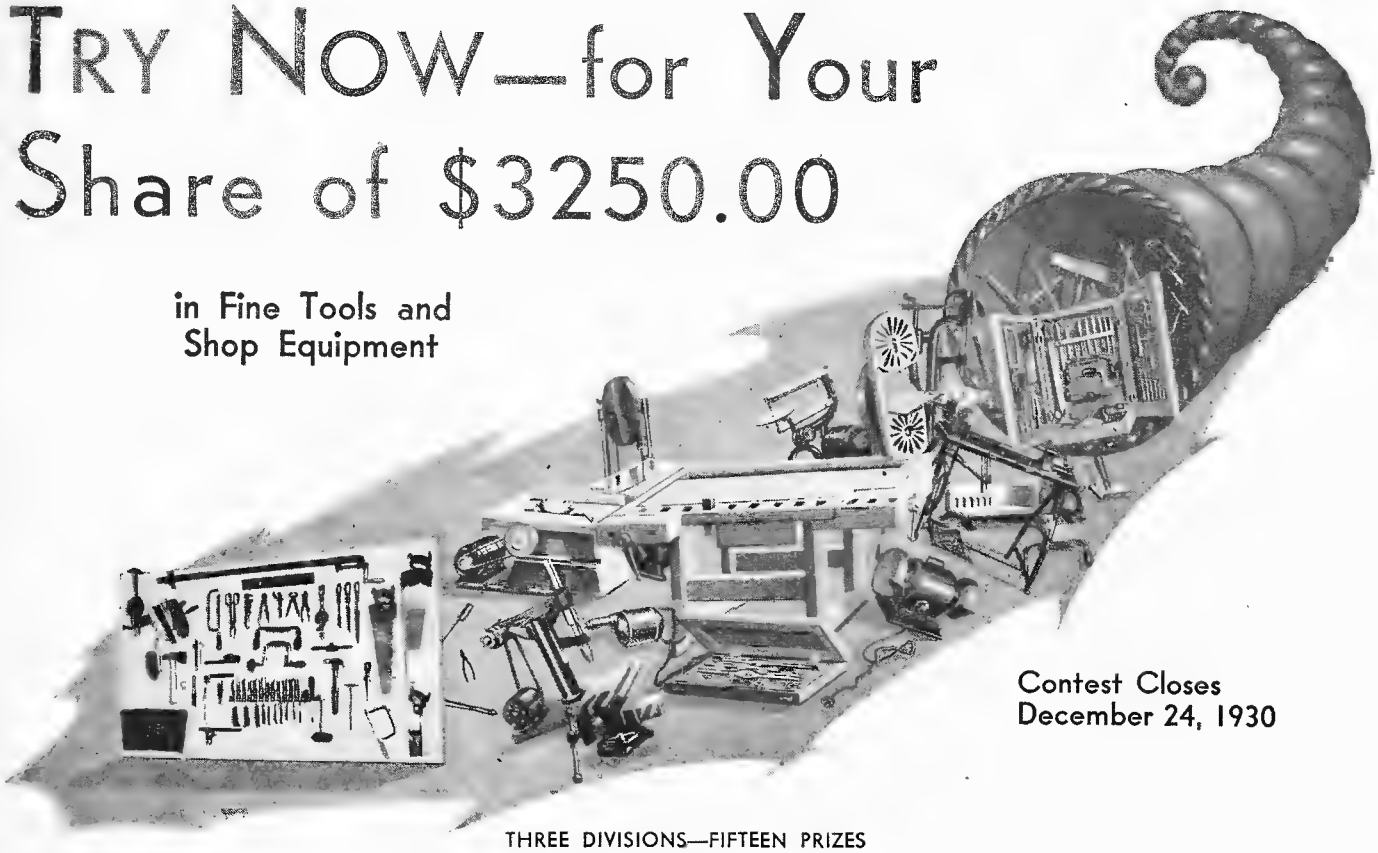
There are three species of olives of the "Olea Europa" branch used in the United States. They are: (1) the Mission olive; (2) the Nevadillo Blanco olive; and (3) the Manzillo olive. The Mission olive reaches maturity in December and yields

(*Cont'd on page 746*)

www.americanradiohistory.com

TRY NOW—for Your Share of $3250.00

in Fine Tools and Shop Equipment



Contest Closes December 24, 1930

IF YOU HAD $50.00, or $200.00, or $400.00 to spend in equipping a home workshop, what tools and equipment would you buy?

SCIENCE AND INVENTION will award $3,250.00 in fine tools and home workshop equipment to the fifteen people who answer this question most effectively.

THE THREE POINTS

There are three points to consider — QUALITY, COMPLETENESS, AMOUNT OF MONEY ALLOWED.

Your problem, in a nutshell, is to balance QUALITY against COMPLETENESS, and both of these points against the AMOUNT OF MONEY ALLOWED. . . . The fifteen prizes, totaling $3,250.00 in fine tools and workshop equipment, will go to the fifteen people who tell us how to get the MOST and BEST tools and equipment for the AMOUNTS OF MONEY named in the three price divisions. You may enter lists for any or all the divisions.

Each winner in the contest will receive exactly the tools and equipment he has named in his winning selection. . . . If, however, his winning selection duplicates tools or equipment he already owns, we shall be glad to substitute any others he may desire in their place, provided the cost is the same.

YOUR HARDWARE DEALER WILL HELP YOU

Thirty-five thousand hardware dealers have been informed about this Contest. They will be glad to cooperate with you in selecting your Ideal Home Workshop.

THREE DIVISIONS—FIFTEEN PRIZES

5 at $50.00

In the First Division, you select the ideal tools and equipment you would buy if you had $50.00 to spend.

The prizes in this division will be five sets of tools and home workshop equipment, costing $50.00 per set at the manufacturers' list price. Tools and equipment will be exactly those selected by the winners.

5 at $200.00

In the Second Division you select the ideal tools and equipment you would buy if you had $200.00 to spend.

The prizes in this division will be five sets of tools and home workshop equipment, costing $200.00 each at the manufacturers' list price. Tools and equipment will be exactly those selected by the winners.

5 at $400.00

In the Third Division, you select the ideal tools and equipment you would buy if you had $400.00 to spend.

The prizes in this division will be five sets of tools and home workshop equipment, costing $400.00 each at the manufacturers' list price. Tools and equipment will be exactly those selected by the winners.

GO AT IT OPEN-EYED!

ASK US FOR CATALOGUES to help you win your share of the $3,250 in fine tools and equipment in the Ideal Home Workshop Equipment Contest.

The $400 prizes in this contest are going to be won by men who are fully informed on tools and equipment and their cost. . . . Likewise the $200 and $50 prizes. . . . Study the catalogues yourself, and boost your chances of being one of the winners.

Go at It Open-Eyed! . . . Give yourself a break. . . . Ask us for catalogues to help you win.

HOW TO DO IT

GET A REPRESENTATIVE group of tool and equipment manufacturers' catalogues. Pick manufacturers who make tools and equipment of established quality.

Write down the names of the tools and equipment units you think would be ideal for the home workshop, together with the manufacturers' list prices.

For each list write a letter of from 200 to 500 words telling plainly why you chose the tools you did. Send in the letter with the list.

Winners in the Ideal Home Workshop Equipment Contest will be announced in the April, 1931, number of SCIENCE AND INVENTION.

Follow These Simple Instructions

A—List your ideal tools and equipment with manufacturers' names and list prices, keeping the total within the amount named in the division the list is intended for.

B—Write a letter of from 200 to 500 words explaining why you chose the tools and equipment you did.

Contest Rules

1. Entries must reach our office, 381 Fourth Avenue, not later than midnight, December 24, 1930.

2. Only one prize will be awarded to any winning contestant, but you may enter lists in any or all the divisions.

3. The contest is free and open to everyone. You need not be a reader of SCIENCE AND INVENTION to enter.

4. In case of ties, tieing contestants will receive prizes of identical worth according to the division involved.

5. Neatness of lists and pointedness of letters will count in the award.

6. No employees of this magazine or members of their families are permitted to enter the contest.

7. The decision of the judges will be final.

8. The winning lists will be those in which completeness and quality are best combined in the judgment of the committee, within the money limits of the divisions involved.

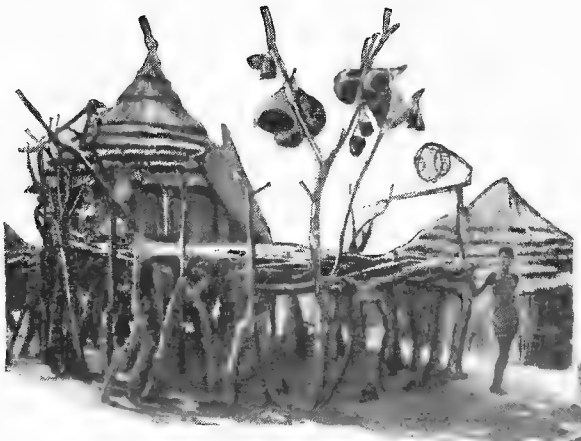
Machine Tools, Motors, and Miscellaneous Working Equipment Will Be Considered in This Contest

www.americanradiohistory.com

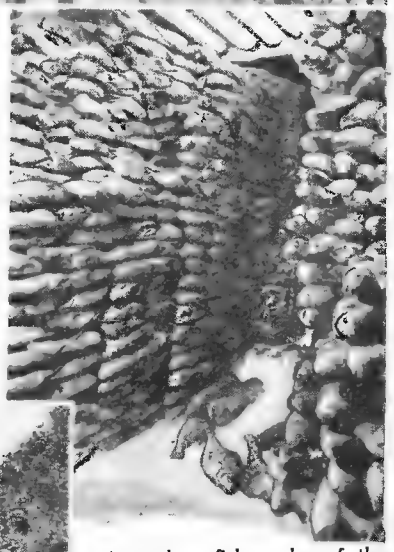
CACHES

Not Only in Modernized Countries Are Foodstuffs Stored for Future Use. The Methods of Storage Differ in Different Parts of the World. Foods Are Stored in Underground Repositories, or Suspended from Bags Dangling from Poles, or Beehive-like Structures Erected on Sticks, as Well as in Expensive Barns or Modern Ice Houses

Blacks on the plains of Angola pack bags of grain in grass, then weave a binding around the bundles to make them look like beehives, and erect the bundles on posts so as to protect them from mice and other vermin, as well as from the chickens and pigs. Angola is in Portuguese West Africa. It lies south of the Congo River, with a population of something over four millions, about one-tenth of which is European. Their dwellings are circular huts more or less of the type suggested.



In the wilds of Sudan there are two methods of storing foodstuffs. Baskets of grain and vegetables are suspended from the branches of a tree to keep them out of reach of prowling animals. In the background is a granary, and the raised platform is a threshing floor where grain is beaten or trampled and winnowed out as it falls through the cracks to the ground.



A modern fish cache of the white man is found in the plant of Lady Brothers, Sandusky, Ohio, where the temperature is kept at 14 degrees Fahrenheit.

Ewing Galloway Photos

Mah Patimah, a famous princess of Bali, Dutch East Indies, photographed in front of one of her beautiful rice barns in the grounds of her palatial home at Singaradja, the capital of the island.

Sumatrans are communists. They have common store houses for their grain and other foodstuffs. The granaries are used by groups that club together. The communistic plan is not general in scope, but confined to groups. The roofs of the typical granaries here shown are curved to be symbolic of the water buffalo, the island's principal beast of burden. The granaries are built on stilts, and taper upward in a peculiar manner which gives them a top-heavy appearance. Two granaries built side by side, close together, are illustrated.

Emptying grain into underground silos at Matea. The covers of granaries can be seen along the street.

Peruvian Indians put potatoes in a cache built of straw and erected on a crude, wooden scaffold. These Indians find this system of value in protecting their foodstuffs from being consumed by animals. Many caches of this type are found in the Huancayo Valley where these Indians live. And so we see that peoples all over the world lay aside stores of food and make provision for protecting the food against the ravages of animals rather than those of the elements.

www.americanradiohistory.com

Converting Your Basement

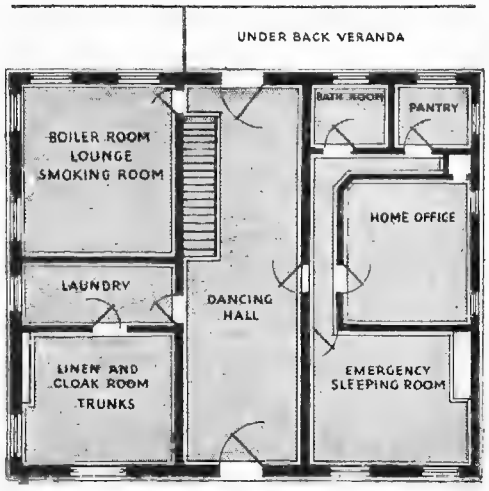
A Summary of What Some Fourth and Fifth Prize Winners Did With Their Cellars in Our Basement Conversion Contest

QUITE a number of interesting facts have emerged from a careful consideration of the entries for our basement contest. Of the prize-winning plans, eighty-three per cent. made provision for laundries, and more than half of the laundries included washing machines, and many included ironing machines. Quite a number provided means for drying clothes in the basement during inclement weather, in which cases the furnace was partitioned off to prevent coal dust from soiling the clothes. Sixty-five per cent. of the prize-winning plans included a game room of some sort for entertainment or recreation. A few provided part of their living space in the basement. Of the eighteen prize winners, three provided billiard tables, one a gymnasium, and one a maid's room. There were three kitchens, two dining rooms, ten bathrooms, three garages, three children's playrooms, and two showers.

A view of "Dockerley," the residence of Mr. R. W. Hatcher, of Milledgeville, Ga., who is one of the Fifth Prize winners.

ONE of the Fourth Prize winners, Mr. J. L. Barth, of Lancaster, Pa., divided his basement into two portions, converted the larger portion into a reproduction of an old world Pennsylvania-Dutch living room, and in the other part he made provision for a laundry, workshop and, of course, hot water and heating plant.

Mr. Barth commences his description with some very sensible observations concerning elementary requirements. Before converting the basement, he says, it should be provided with good light, ventilation, and a dry cement floor and wall. The basements of most modern homes already possess these qualities. His first task was to dispose of the coal bin by tucking it away under the cellar steps in a dirt-proof compartment. The coal-bin-stairway combination, partition archway, stone closet and fireplace (see wash drawing below) were all constructed roughly of scrap lumber over which a coat of prepared exterior stucco (product of Rocbond Co., Harrisburg, Pa.) mixed with chloride and water solution to quite a plastic state, was then troweled on and stippled with a stiff

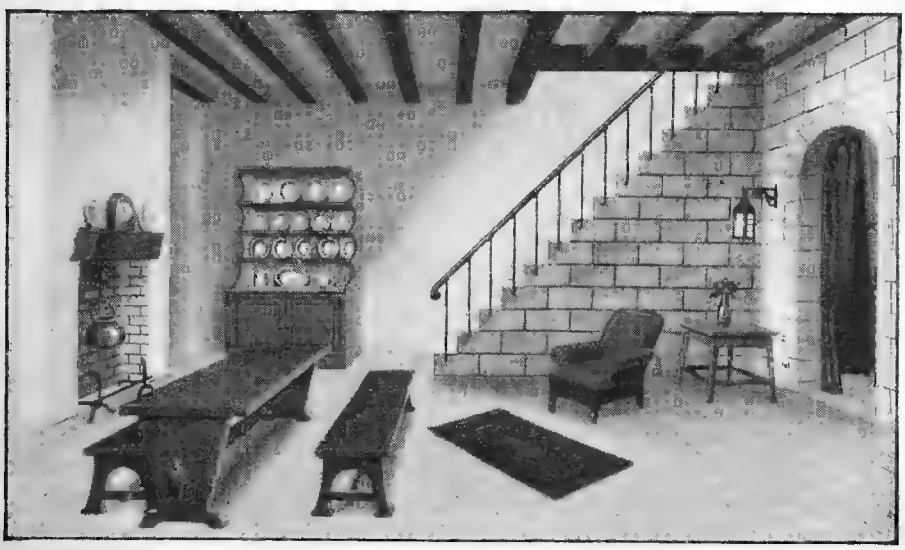


Plan showing what Mr. R. W. Hatcher did with his basement. (See text.)

brush dipped in the solution. To raise a rough texture, blow on green spar sand, drag over with a triangle and score out the blocks with a soft carpenter's pencil while still wet. This produces a clever effect of old cut stone. This method is cheap, for the surface becomes hard as rock, will not crack, and is impervious to moisture.

Mr. Barth wanted an old colonial staircase railing of wrought iron, but the cost was prohibitive. Fortunately he hit on a little idea which did the trick. In the construction of concrete buildings round and square steel tie rods are used for reinforcement purposes. A ¾-inch square rod of this type has something of a rough hammered finish on the surface, and is just about made to order for the job. He cut the rod into suitable lengths, sandpapered them to bring out the highlights, and coated with clear lacquer to prevent rust. The ends of the rods were bent over L-shaped, and driven into ¾-inch holes bored in the sides of the steps. A plain wood hand rail with a bend at the bottom was rubbed with an oil finish and the top ends of the iron rails screwed into the underside. The result thus cheaply obtained looks very effective.

The "hutch" cabinet, planked table and benches were all treated with oil and hand rubbed. No paints or varnishes were employed. The cabinet represents an excellent opportunity to show off your antique pieces of plate and pottery, while the old stone closet provides the lady of the house with excellent storage space for fruit and vegetables.



One of the Fourth Prize winners, Mr. J. L. Barth, of Lancaster, Pa., converted part of his basement space into this attractive reproduction of a quaint hundred-years-old Pennsylvania-Dutch living room.

MR. R. W. Hatcher, of Milledgeville, Ga., is the winner of one of the Fifth Prizes, and he describes the conversion of the basement of an old brick mansion which was built in 1839. This base- (*Continued on page* 751)

www.americanradiohistory.com

Natural Gas

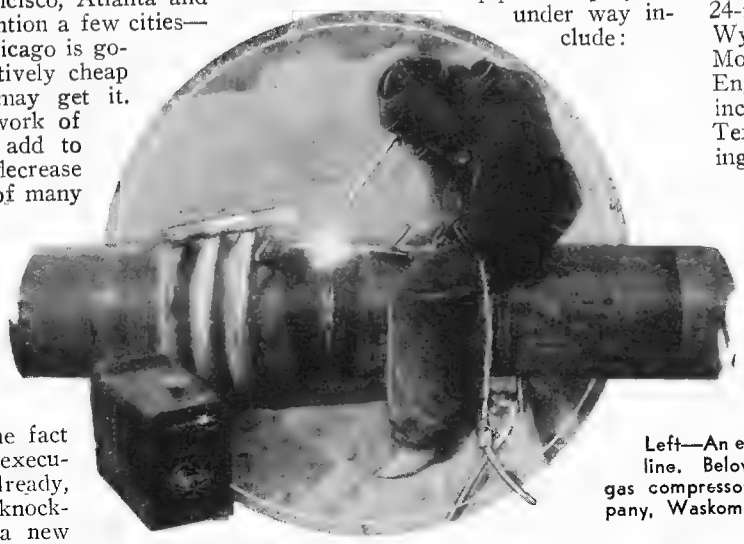
An Industrial Giant

By H. L. Kauffman

NATURAL gas almost overnight seems to have taken the country by storm. Denver, Kansas City, St. Louis, San Francisco, Atlanta and Birmingham—to mention a few cities—already have it. Chicago is going to get this relatively cheap fuel. New York may get it. That this huge network of gas pipe-lines will add to the efficiency and decrease operating expenses of many industrial plants is unquestioned. That it will revolutionize power generating equipment in many cases is not unlikely. But whatever changes it may bring about, the fact must be faced by executives, that, if not already, there will soon be knocking at their door a new servant who seeks admittance: natural gas.

It is not our purpose in this article to compare the value of natural gas with other fuels. But we do want to show how the use of this fuel is spreading, the many gas pipe-lines under construction, the sources of supply, and such matters.

An accompanying map gives a picture of the major existing, building and definitely projected natural gas pipe-line systems. Upwards of a quarter of a billion dollars will be spent on lines now being laid or definitely projected. The Cities Service Company's line from the Panhandle of Texas to Chicago will cost around $100,000,000. Missouri-Kansas Pipeline Company now has 5,000 men at work building a gas line from Amarillo, Texas, to Illinois and Indiana points. This line will also connect with gas fields of the Missouri-Kansas Company in Missouri and western Kentucky. Some of the other gas pipe-line projects under way include:



A 950-mile long 22- and 24-inch line which the Lone Star Gas Company is laying from the Texas Panhandle to Nebraska and Iowa points; a 300-mile 24-inch line being laid from northern Wyoming to Butte, Montana, by the Moody-Seagraves Company and Hope Engineering Company; a 60-mile 16-inch line from the Quinton field in Texas to Oklahoma, which work is being done for the American Natural Gas Company; a 110-mile line to Sedalia, Mo., and a 116-mile line to Superior, Neb., by the Cities Service Company; while in the east the Columbia Gas and Electric Company is laying a 200-mile 20-inch line from West Virginia to (*Continued on page 748*)

Left—An expansion joint being welded into a gas pipe-line. Below—Twenty-eight 160 H.P. Hope vertical gas compressors in the plant of the Dixie Gas Company, Waskom, Texas, furnishing gas for industrial and domestic purposes.

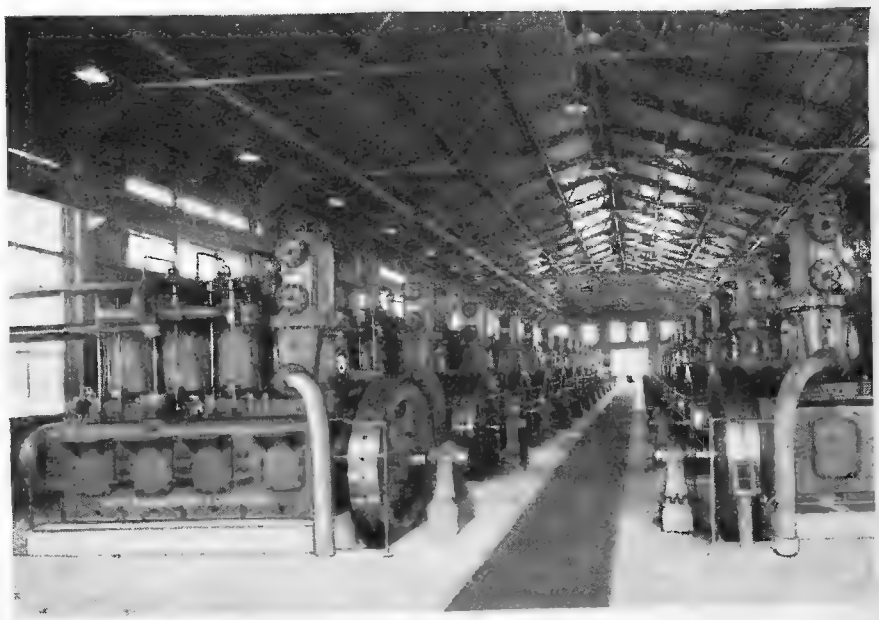


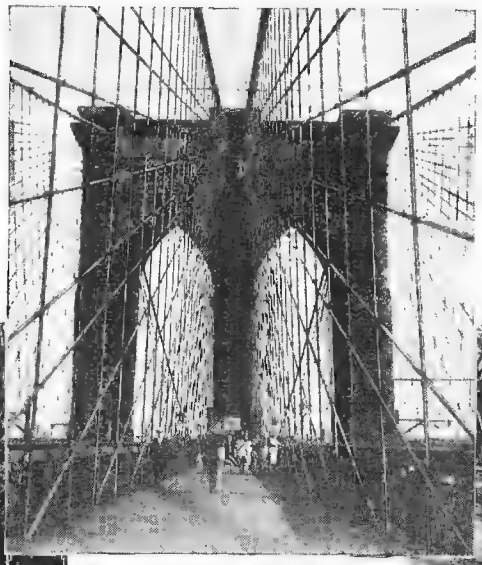
Illustration at the head of this page shows gas-line pipes being assembled and welded together ready for laying.

www.americanradiohistory.com

Bridges—the World Over

Edwin Natural Bridge in southern Utah is one of the natural wonders of the west. It is about 90 feet high and 200 feet long. Motor bus tours now take people to these natural wonders of Utah.

Below—A bridge across the Colorado River. As one can see, this was not intended for heavy traffic. Compare this structure with the first of the larger suspension bridges shown in the center photograph.

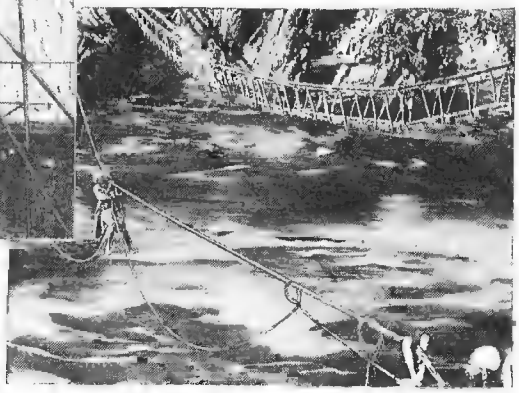


A beautiful old covered bridge on the Virginia side of the border near Covington, Va., in the White Sulphur Springs region, can be seen above. This would give joy to any landscape painter or artist.

Competition between crude rope bridges is keen at Cashmir. The tolls for the foot bridge at the right are a little more expensive than the "breeches buoy" type of bridge where a man is pulled across the mountain stream.

Below—Ponte Vecchio at Florence, Italy. Numerous small shops project from one side of the bridge. Corridor on top contains many famous paintings, and was once the pride of the de Medicis.

The cables of Brooklyn Bridge, New York City, present a design like a huge spider web. This view shows the Gothic arches of the bridge tower. A similar arch is found at the opposite end.



Below—Curacao Pontoon Bridge opened. Two steam-driven boats, fastened to the end of the pontoon bridge, provide the propelling force to turn the structure out of the way of river vessels.

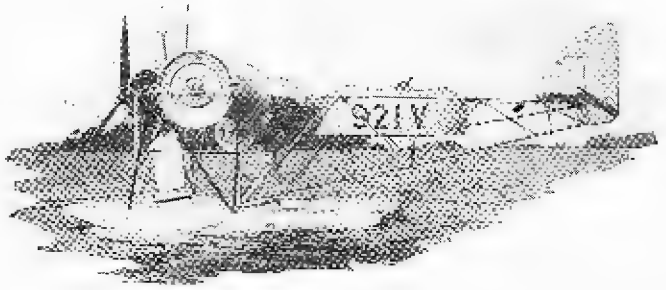
Photos by Ewing Galloway

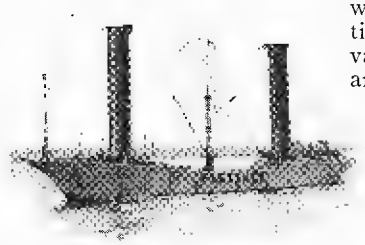
www.americanradiohistory.com

The Rotor Plane

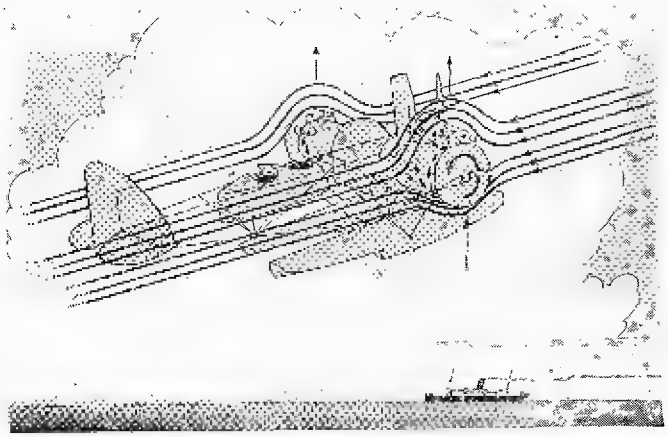
By John E. King

New Mystery Airplane Using Flettner Rotors Instead of Wings Makes Secret Tests





Above — A photograph of the new airplane as she appears when at rest on the water. Right—Anton Flettner's rotor ship Baden - Baden. Below—Our artist's impression of the new plane in flight, showing the air currents.



FROM Mamaroneck, N. Y., comes the news that experiments are in progress with an entirely revolutionary type of airplane, which, instead of having the conventional wing surfaces, is equipped with horizontally mounted rotor cylinders similar in action to the vertical ones employed by Anton Flettner in his rotor ship *Baden-Baden*, in which he crossed the Atlantic in 1924. According to reports, certain preliminary trials have already been made, but the results of these, together with much of the detail structure of the machine, remain closely guarded secrets.

One of the earliest uses made of air currents by man was to propel his ships, which he did by spreading a sail to the wind. Although at first blush it appears to be a far cry from man's early sailing boats to the modern airplane, the underlying principles are almost identical. In a heavier-than-air flying machine, support is obtained by spreading wings, or aerofoils, to the air currents set up by the rapid movement of the machine through the air. These aerofoils are so shaped that on the under side an upward pressure is exerted by the rushing air currents, while in the case of the upper side a partial vacuum is created which produces an added lifting effect, as shown in Fig. 1.

Anton Flettner originally intended to build ships with metal sails having a cross-section similar to that of airplane wings, for he was convinced that such metal sails would have a much more powerful effect than canvas sails of orthodox design. He planned to mount these metal sails on a pivot mast in such a way that they could revolve freely about the pivot and, by means of a special rudder, be swung into such a position that the wind would drive the ship along. These plans did not materialize, however, for he turned his attention to revolving cylinders instead.

To understand the theory behind the action of rotors, it is necessary to go back to the discovery of what is known as the Magnus Effect, after its discoverer, Professor Magnus of Berlin, who first described it in 1853, but it took over twenty years of experiments before an explanation could be found.

Briefly, it was determined that when a cylinder revolves, the stratum of air nearest to it revolves with the cylinder, owing to the fact that the friction between the air and the cylinder is much greater than the friction of air molecules against each other. The nearest stratum causes the next one to revolve, but slightly more slowly, and so on outwards until, when a certain distance from the cylinder is reached, the influence ceases.

If a current of air is directed against such a revolving cylinder, the circumferential speed of which is greater than the velocity of the air current, the streamlines are so directed that the air is rarefied on one side by the friction of the cylinder, while on the other side it is compressed. These changes of air pressure are the causes of the Magnus Effect, and they give rise to a force which is exerted in a direction away from the partial vacuum side of the cylinder, and through the centre of the compressed air patch, as shown in Fig. 2. In this figure, the arrow representing the direction of the resultant force would, in the case of a rotor ship, be the direction of travel; in the case of a plane, that force is used to keep the machine in the air, while horizontal motion is achieved by means of a propeller in the usual manner, as indicated in the photograph. Actually, the direction of power is not always at right angles to the direction of the air current, but diverges to an extent which is dependent upon the speed ratio of the wind current to that of the circumferential speed of the cylinder.

Flettner commenced his experiments with rotors at Gottingen in 1922, and found that the power exerted upon a normal cylinder revolving in an air current is four to five times that exerted upon an ordinary sail. Then he found that if the ends of the cylinders are closed with discs having a diameter larger than that of the cylinders, the power produced is about ten times that exerted upon a normal sail, but a necessary condition for this is that the circumferential speed of the cylinders must be 3 to 4½ times as great as that of the wind.

The rotor airplane (which is being built on a barge at Mamaroneck, N. Y., to ensure inaccessibility and secrecy) appears, in the light of these facts, to be but a logical development of sound principles, and the inventor hopes to effect a revolution in aeronautics. As can be seen from the photograph, a single motor mounted in the nose of the machine drives a three-bladed propeller which draws the plane along in the usual manner (*Continued on page* 750)

Fig. 1:—Section of an airplane wing, showing how lift is obtained.

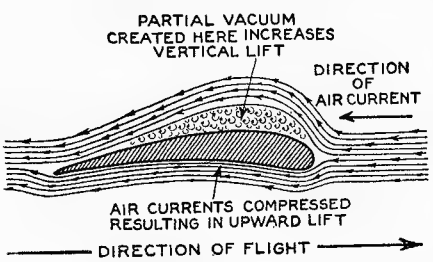
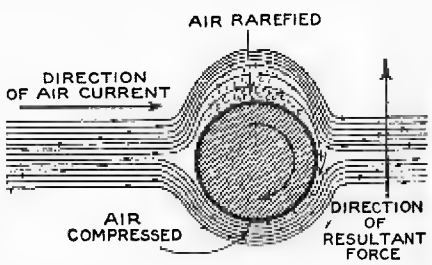


Fig. 2:—Plan view of revolving rotor, showing air currents and forces.

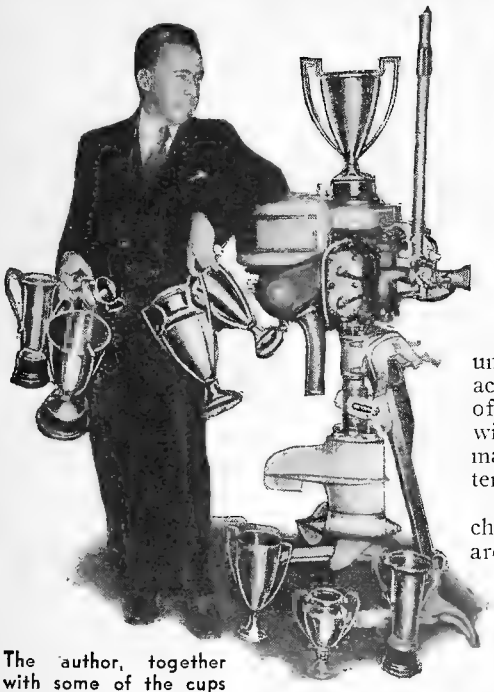


www.americanradiohistory.com

How to Build this Record-Breaking

By J. Phillips Dykes

Rear Commodore and Secretary, American Outboard Association



The author, together with some of the cups he has won, photographed beside the outboard motor with which his boat is powered.

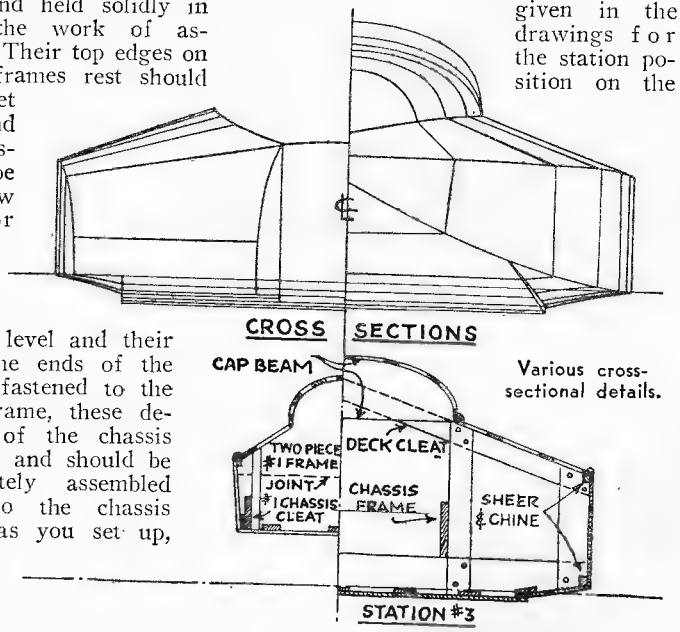
IN building a boat of this kind, one should first realize that it is particular work where care is necessary, but it is not work which is exceptionally difficult or impossible for an amateur to figure out. Follow the instructions carefully and figure out one detail at a time. If it is your first boat and you try to dope out all the details at once, the plans and instructions may confuse rather than help you. In addition to the exercise of care and accuracy in assembling the parts, the most important caution in building this racer is to see that each individual fastening, whether it be a screw, bolt, or clinch plank fastening, does its share of the holding.

Before commencing work on your boat, decide whether you will make your own full size patterns, or have them supplied you ready-made. Ordinary wrapping paper will suffice if you make them yourself. But by all means be positive in your dimensions and do not attempt to build your racer unless your full size paper patterns are accurately cut. A boat that is all out of line will be the result of carelessness with patterns. Write me care of this magazine if you desire full sized patterns.

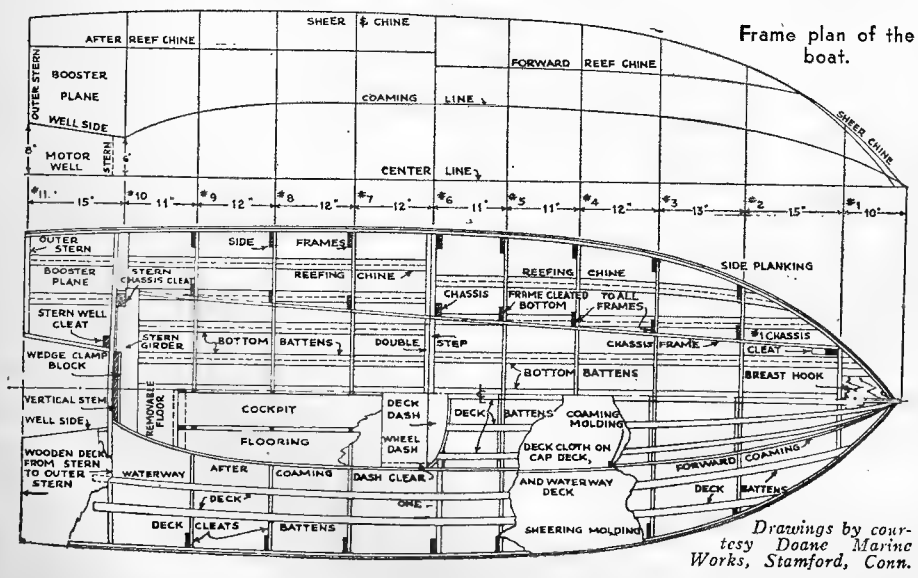
First we cut out and set up the two chassis frames. Dimensions for these are given in the drawings. Since the boat is built bottom side up and these chassis frames are the sole support for the framework while the boat is being built, they must be supported and held solidly in place before the work of assembling can start. Their top edges on which the bottom frames rest should be about 3½ feet above the floor and the ends of the chassis frames can be supported by saw horses, boxes, or other solid supports securely fastened to the floor. The chassis frames must be level and their sides plumb. As the ends of the chassis frames are fastened to the stern and No. 1 frame, these determine the width of the chassis frames at both ends and should be made and completely assembled ready to fasten to the chassis frames. As soon as you set up, fasten the chassis frames to the supports temporarily and fasten your stern and No. 1 frame to the chassis frames using four ¼-inch bolts at the stern joints where the chassis frames fasten to the chassis girder cleats, and three bolts for No. 1 frame in fastening to No. 1 chassis cleats.

Now run a cord from No. 1 frame to the stern and use it as a center line in checking up the center of each bottom frame. At the same time check up your stern and No. 1 frame to make sure they are square with the center line.

Now you are ready to put each bottom frame across the chassis frames in its exact location as indicated by the dimensions given in the drawings for the station position on the chassis frames. These station positions may be marked on the chassis frames before setting them up, and should be marked on the outside. In setting up the bottom frames be very careful to get them on the correct side of each station mark. For instance, the double step members center or join together on the station mark, all bottom frames forward and aft of the step being on the forward side of the station marks and the side frames on the after side. As the chassis frame cleats are the only fastening of the bottom frames to the chassis frames these come next, but first screw them to the chassis frames, putting three No. 10, 1½-inch screws into each cleat, and then both the bottom frames to these cleats, using two ¼-inch bolts as shown on the cross-section construction details. Remember that both the chassis frame cleats and the side frames at the step are ¾-inch and all others ½-inch thick. The side frames can be most easily fastened to the bottom frames before setting up, as all side frames are at right angles to



Various cross-sectional details.

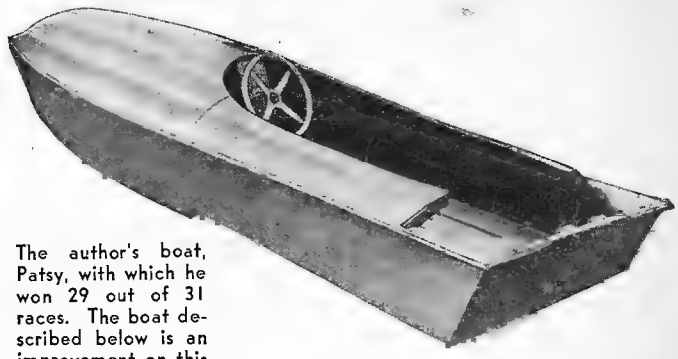


Frame plan of the boat.

Drawings by courtesy Doane Marine Works, Stamford, Conn.

www.americanradiohistory.com

Outboard Boat



The author's boat, Patsy, with which he won 29 out of 31 races. The boat described below is an improvement on this model.

THIS Article Has Been Specially Prepared by Mr. Dykes in Answer to Innumerable Requests from Readers for Plans and Instructions on Building an Outboard Motor-Boat. Mr. Dykes Has Responded by Giving Below Full Instructions for Building a Boat Which Is an Improvement on His Own. This Boat Won 29 First Places in 31 Races for Which It was Entered. Build It in Your Basement During the Winter Months and Have It Ready in the Spring.

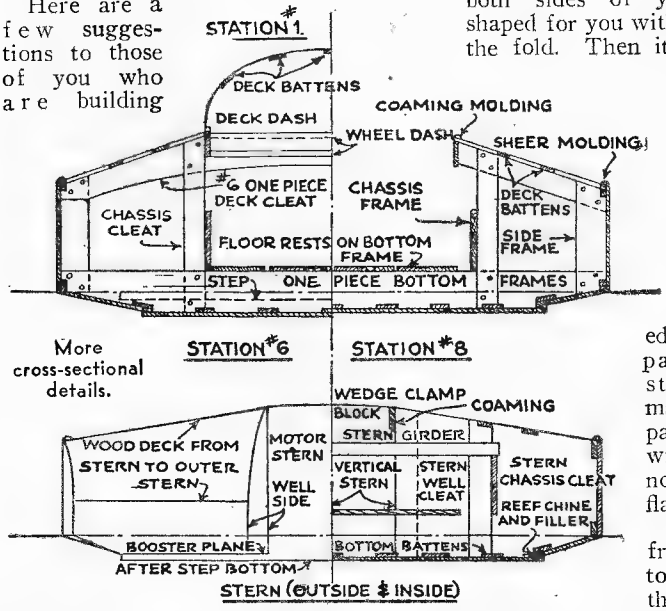
Here are a few suggestions to those of you who are building directly from full-sized patterns, for marking your frame lumber. As the pattern plans would be too large to blue-print each half, the bottom frames are shown on only one side of the center line, and you can mark both halves of each bottom frame in either one of two ways. One way is to lay the large pattern plans directly on your lumber, pricking along the lines of the frame you are marking, through the blue-print into the wood with something sharp such as the point of a compass, scissors, sharp nail, or the like, for the shape of your frame on one side of the center line and then lay your paper over, face down, and prick through for the other half, being sure to have the top edge of each frame exactly straight.

The other way to mark your lumber from the patterns is to take a large piece of heavy wrapping paper and fold it double so that the fold comes exactly on the center line of the pattern to be marked. Then prick along your pattern line through both folds of your heavy wrapping paper. You can do several frames at one time if you wish. When you take your wrapping paper out from under the pattern plans and unfold it, you have both sides of your bottom frames shaped for you with their center lines on the fold. Then it is just a matter of marking, cutting out each pattern and laying it on your lumber which can be marked directly from the pattern. If this method is used, mark the top edge of each frame with a straight edge and then lay the pattern along this straight line before marking the rest of the pattern, as even heavy wrapping paper does not often lie exactly flat and straight.

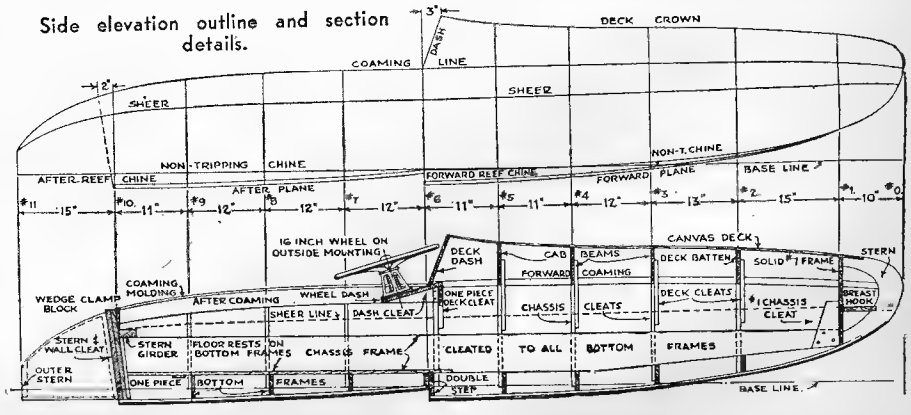
In cutting out these frames, it will save time to make the cuts on the bevel indicated on the plans. For instance, the bevel shown on No. 2 side frame is 3/16-inch, which means that the forward edge must be cut away 3/16 of an inch, so that the stringers and planking when bent around the side will rest evenly against this outer edge of the side frame. Also, be sure to cut all side frames in pairs, so that the bevels will be correct for both pieces. In bolting the side and bottom frames together at the chines, make sure that the ends of the bottom frames are beveled and that the side frames are put on the forward or after side of the bottom frames as the plans indicate. All the other parts, such as the stem, breast hook, well sides, outer stern, etc., can be marked directly from the pattern, being beveled as indicated when cutting out.

Some special instructions will help in putting together the stem and stern assemblies. The stem assembly consists of the one-piece stem from bottom planking to decking, the breast hook, the No. 1 frame and the No. 1 chassis cleats. The stem is first beveled to the dotted line indicated on the patterns, which together with the breast hook and No. 1 frame are screw fastened together at the points indicated, using No. 8, 1¼-inch screws. The No. 1 chassis cleats are fastened to No. 1 frame with four No. 10 1½-inch screws. The stern assembly requires a one-piece stern with a vertical stern screw fastened to it using No. 10 1½-inch screws, and the two chassis girder cleats are also screw fastened to the stern with No. 10 1½-inch screws. A wedge clamp block is fastened along the inner side of the vertical stern to prevent the motor clamps from loosening, with the possible loss of the motor as a result. The stern girder is also fastened to the stern with No. 10 1½-inch screws, except at the vertical stern where three 5/16-inch bolts are used, and at the chassis girder cleats where one 5/16-inch bolt in each is used. The stern well cleats are set in marine glue and fastened to the stern with No. 8 1¼-inch screws, being careful to bevel their inner edges to bear evenly against the well sides. The well sides are cut from the patterns with their fore and aft (*Continued on page* 740)

More cross-sectional details.



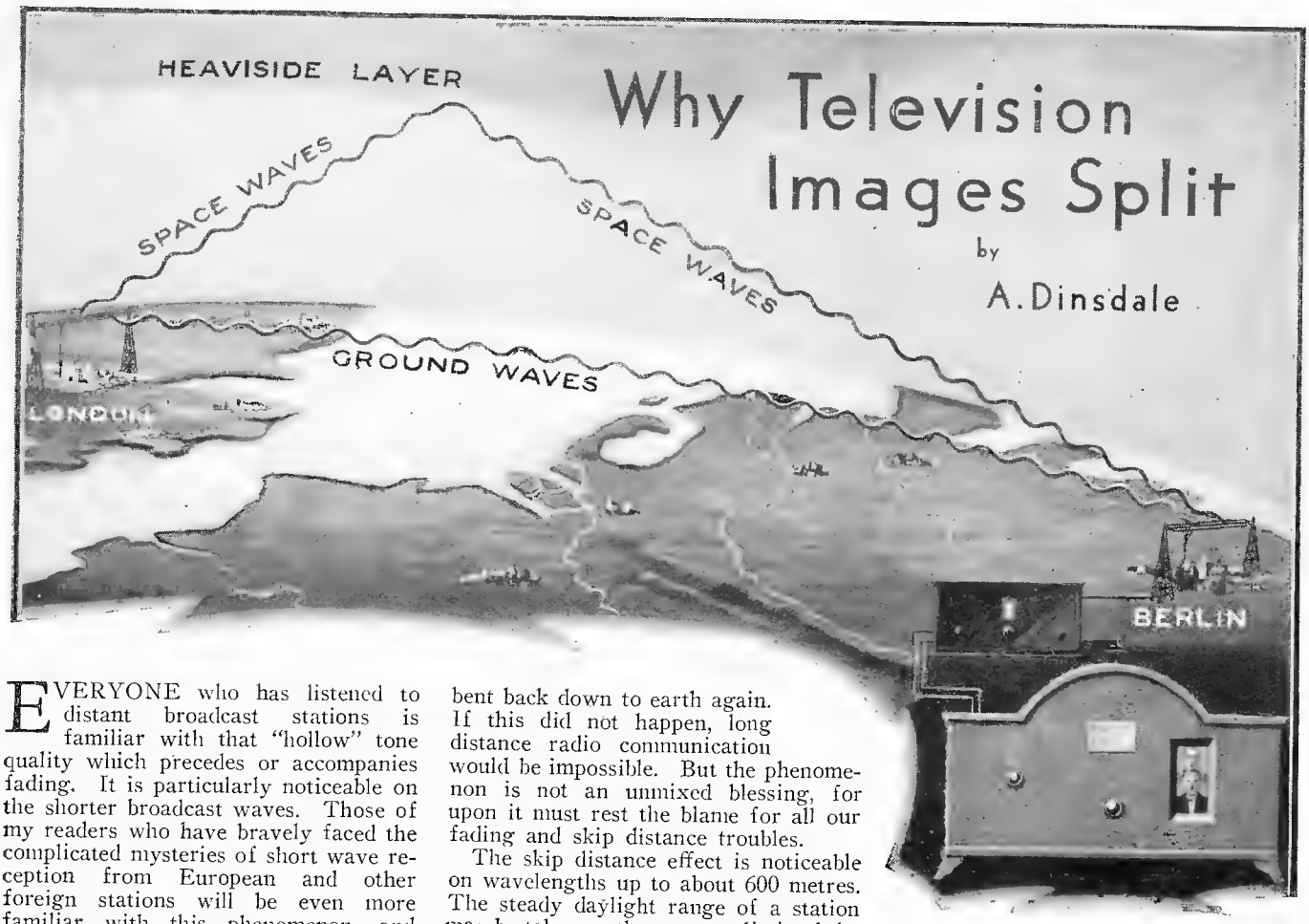
Side elevation outline and section details.



www.americanradiohistory.com

Why Television Images Split

by A. Dinsdale



EVERYONE who has listened to distant broadcast stations is familiar with that "hollow" tone quality which precedes or accompanies fading. It is particularly noticeable on the shorter broadcast waves. Those of my readers who have bravely faced the complicated mysteries of short wave reception from European and other foreign stations will be even more familiar with this phenomenon, and very familiar also with that other bane of short wave radio reception, the skip distance effect.

The radiated wave of any radio transmitter, broadcast or otherwise, has two components. One of these remains anchored to the surface of the earth, and is called the ground wave. The other shoots off at a tangent to the surface of the earth, and is called the space wave. The shorter the wavelength the more readily does the earth absorb the ground wave. The space wave, being free of the ground, is not subject to absorption by the earth, and would shoot off into space but for the fact that, in the outer atmosphere, there is an electrically conducting layer of ionized atmosphere, known as the Heaviside Layer. When the space wave strikes this layer it is reflected, or bent back down to earth again. If this did not happen, long distance radio communication would be impossible. But the phenomenon is not an unmixed blessing, for upon it must rest the blame for all our fading and skip distance troubles.

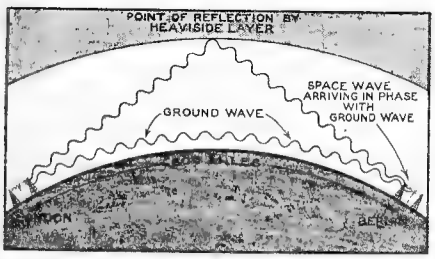


Fig. 1—Showing how the space wave, reflected by the Heaviside Layer, arrives in phase with the ground wave. Good reception results.

The skip distance effect is noticeable on wavelengths up to about 600 metres. The steady daylight range of a station may be taken as the extreme limit of the influence of the ground wave. Any range in excess of that distance obtained at night is largely due to reflected space waves. There are many things about the Heaviside Layer which we do not yet fully understand, but it is generally recognized that it is closer to the earth, and more heavily ionized during the day, due to the action of the sun's rays. At night there is less ionization, and the height of the layer increases. The exact height of the layer varies not only with the hour of the day but also with the season of the year. Even so, at any given time, the layer cannot be visualized as having a smooth concave surface. On the contrary, so far as we know, it is better to visualize it as being like the underside of a dense billowing cloud, parts of which are continually rising and falling. In that way we get a better idea of the unevenness and indefiniteness of the "surface."

Fading effects, due to interference between ground and space waves, are bad enough in connection with sound broadcasting. But one of these days we are going to have visual accompaniment to our sound broadcasting in the shape of television broadcasting. How will that be affected? It is a fact that the human ear is more tolerant of defects than is the eye. Unless interference between ground and space waves is sufficient to produce a very markedly "hollow" tonal effect, we do not notice it in sound broadcasting. But in television, experiments have already shown that the more intolerant human eye can and does detect the slightest blemish in the image due to interference. Furthermore, the enormous speeds at which television transmissions are conducted, tend to accentuate the effects, which take the form of double, triple, or even quadruple "ghost" images.

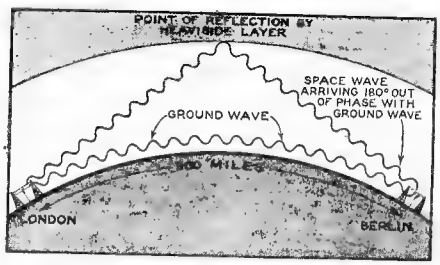
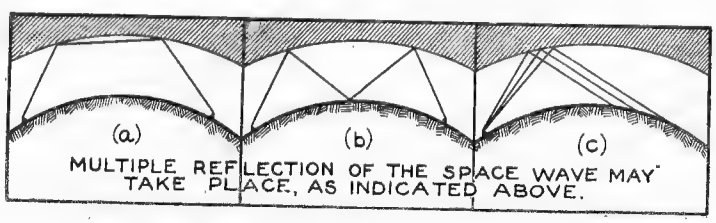


Fig. 2—In this case the space wave arrives 180° out of phase with the ground wave, and if both waves are of equal strength they cancel out and no signal results.

Fig. 3—Illustrating multiple reflections.



Soon after the British Broadcasting Corporation commenced, a year ago, to broadcast the Baird system of television experi-

(Continued on page 761)

www.americanradiohistory.com

Would You Believe It?

Buys $60,000 Building for $20

WHILE others hesitated to bid because of the difficulties of wrecking the solid concrete and stone structure, Joe Shaffer and R. C. Buer bought a $60,000 building for $20 in Los Angeles, California. They had to make an agreement to move it immediately to make way for a new street. They traded a third interest in the building for a nearby lot and moved the building over to it. The result of the freak deal is a $100,000 transaction that was consummated for an expenditure of $20. The photo shows the two men and their $20 building.

Alligator as Water Steed

COMMENCING one of the most curious animal stunts yet devised, Miss Eleanor Link, of Los Angeles Alligator Farm is training "Billy" to draw a canoe through the water. By tapping the alligator on the nose with her whip, she directs him from one side to the other. The photographs here show the alligator crawling into the water and the close-up shows the rope hitched around the alligator's neck, with Miss Link holding the whip.

Whale Trapped in Log Boom

HERE is a 55 foot hump-back whale that became trapped in a boom of logs at Shelton, Washington, after maneuvering from the ocean to Puget Sound. Marooned here in shallow water, amateur whale hunters and lumbermen trod on the whale's back while it was still alive.

Moving an English Village to the United States

IT is reported that the Old Forge at Cockington near Torquay has been purchased by an American and will be completely torn down after all of the pieces have been correctly numbered and the ground mapped and will then be shipped in its entirety, trees and all, to the United States where the town will be re-erected. This photograph shows the famous Old Forge at Cockington.

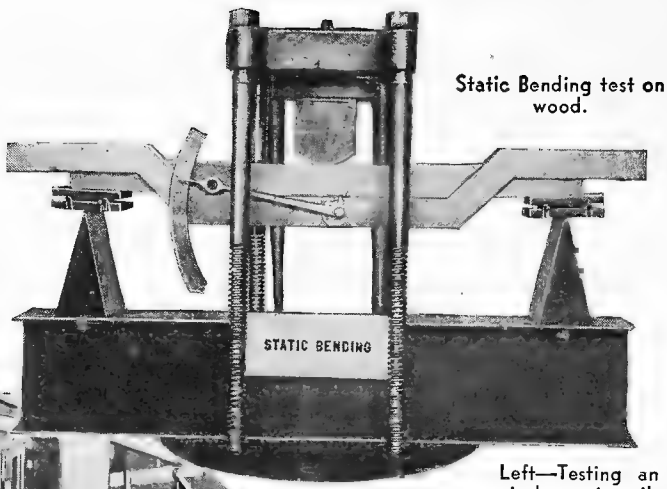
Growing Angle-Worms—A New Business

GROWING angle-worms is the bread and butter of R. B. Bilkosky, of Alhambra, California. He propagates them, then when they are fully grown, they are packed into boxes and shipped to their destination. A can full of worms will survive for about 95 days. Being full of wiggles, they are ready to lure the most disdainful fish. Two and a half acres are devoted exclusively to the raising of angle-worms. These are for sale to fishermen. Five dozen of them are usually packed in a can.

www.americanradiohistory.com

Which Wood Shall I Use?

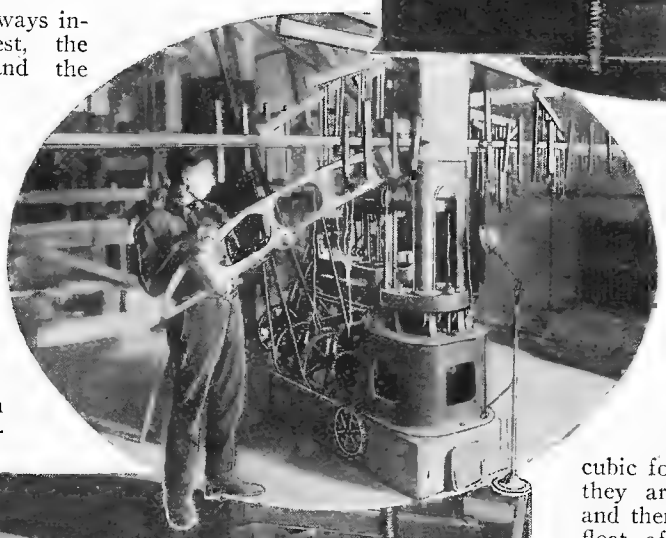
By W. F. Schaphorst, M.E.



Static Bending test on wood.

THE typical American is always interested in the strongest, the quickest, the longest and the largest of anything, and has a mild curiosity regarding the worst whenever the worst can be positively located.

Not only is it interesting to know the best and the worst regarding wood, but such information is valuable. That is why, during a period of some 15 years, 130,000 tests were conducted by the Research Branch of the U. S. Forest Service to determine which woods are best and which are poorest. Facts are therefore now available regarding nearly every variety of wood grown in this country. I have carefully studied a report of the tests and find in it details of the following very interesting properties, ranging all the way from the lightest to the heaviest, the strongest to the weakest, and so on. The localities from which the specimens tested came are given in the report. The following information gives a concise summary of this report.



Left—Testing an airplane wing rib at the U. S. Forest Products Laboratory. The complicated arrangement of "whiffle trees" is used to distribute the test load unevenly, as it would be in the case of a wing rib in service.

Right—Testing a beam of southern yellow pine. Below—Testing a wall panel for strength and stiffness. The addition of a single diagonal two-by-four-inch brace increased the rigidity by 330 per cent. The million-pound testing machine proved it.

Hickory is the heaviest wood grown in the United States. The honors for heaviness were equally divided between two varieties of hickory, one known as big leaf shagbark hickory, specimen from Napoleon, Ohio, and the other known as pignut hickory, specimen from Webster County, W. Virginia. Each of these hickories had a weight of 55 pounds per cubic foot when kiln dried. When green they are slightly heavier than water and therefore will not float. They will float, of course, when dried, the weight of water being 62.5 pounds per cubic foot.

The heaviest wood when green was canyon live oak, grown in Butte County, California. It weighs 71 pounds per cubic foot, and the lightest wood when green is western red cedar, grown in Missoula County, Montana, weighing 24 pounds per cubic foot when green and 21 pounds when kiln dried. It is the "lightest" wood grown in the United States. Northern white cedar, grown in Shawano County, Wisconsin, also weighs 21 pounds per cubic foot when kiln dried, but it weighs 28 pounds per cubic foot when green. No other woods of the temperate zone are as light as the cedars. The hickory, kiln dried, is 2.62 times as heavy as the kiln dried cedar.

Black locust grown in Sevier County, Tennessee was strongest in resisting bending, being 60% more resistant than oak. Black willow grown in Sauk County, Wisconsin proved the weakest in this respect, being only 39% as strong as oak. The locust was 4.1 times as strong as the willow.

(Continued on page 758)

A test of a long yellow pine column in the large column testing machine at the U. S. Forest Products Laboratory.

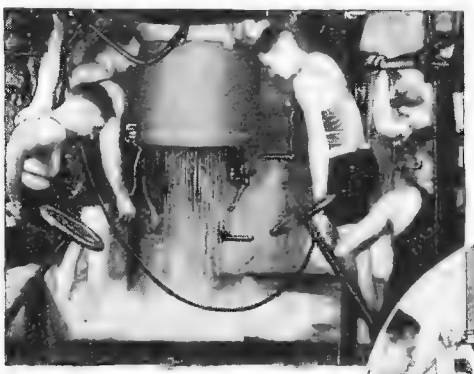
The method of figuring percentages is found at the end of this article.

www.americanradiohistory.com

In the Spotlight of Science

FOR the first time in history, motion pictures were made by the Hearst Metrotone and the Fox Movietone camera men aboard the U. S. Navy Submarine S-22, which depicted how ten members of the crew saved their lives by escaping from the sunken craft. These are the most remarkable photographs ever made under water. They show, from start to finish, the severe tests that are given to what are termed the "artificial lungs." These lungs were invented by Lieut. Charles Momsen of the Navy. In the second photograph, eight of the ten divers are pictured in the submarine control room awaiting the proper depth of water to be reached before their daring escape. After the sea water has been allowed to pour into their compartment until it reaches the height of the men's chests, as shown in the lower photograph, the men don their lungs, enter the escape chamber and shoot safely to the surface. At the surface they either swim for shore or are picked up by boats that may be in the vicinity.

Repeated tests with the artificial lung prove conclusively that men equipped with the lungs may easily escape from a submarine that has been provided with a suitable escape chamber. If this system is applied to all of the submarines in the U. S. Navy, the accidental sinking of one of them will not result in a tragic loss of life.

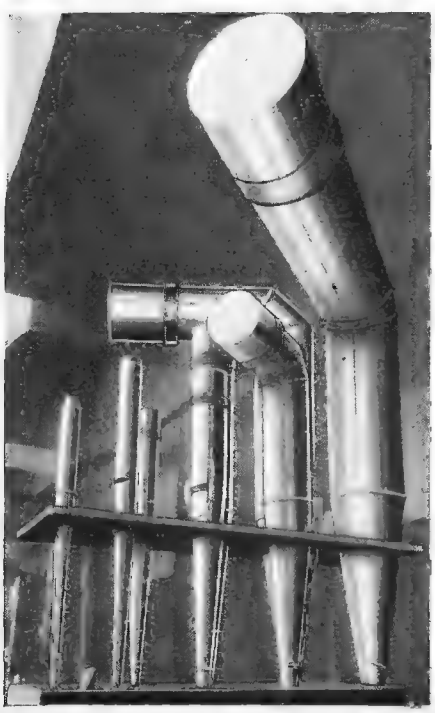


Above — The U. S. Navy Submarine S-22, coming up to the surface after having discharged a load of human freight in a test to show how men can escape from a sunken submarine.

Interior views of the submarine taken while the test was in progress.

New Types of Organ Pipes

WHAT appears to be some futuristic construction is found in the photograph below. Actually this is a view of new styles of organ pipes that are found in the first Institute of Acoustics which opened in Berlin, Germany. This is the only institution of its kind in the world, and it was founded by and is under the direction of Johannes Biehle. The institute is a division of the Technical High School in Berlin where studies of organ- and bell-acoustics, construction of churches, and structural acoustics will be features of the course.



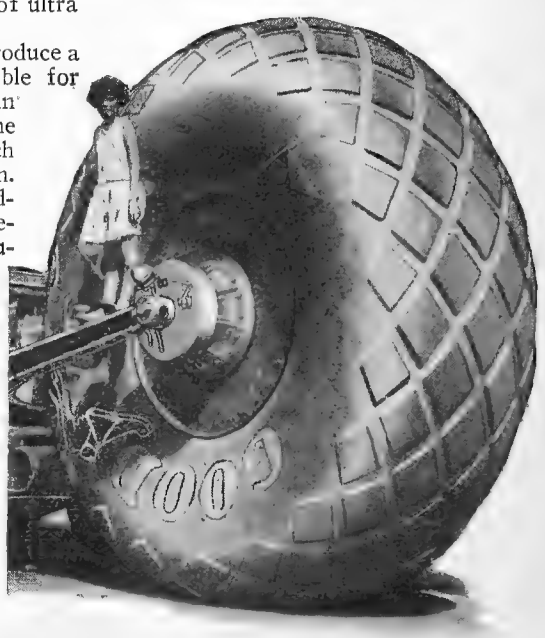
Producing Vitamin D with X-Ray Tubes

A NEW method to make vitamin D by a peculiar kind of X-ray has been developed at the University of Cincinnati. This system, in effect, indicates a wide extension of the field of "artificial sunshine," which goes down deep into the area occupied by invisible rays and proves that not only can vitamin D be produced by the effect of ultra violet light, but also by X-rays.

The sun's invisible rays that produce a tanning effect are also responsible for a large source of vitamin D in plants and these rays have the property of changing foods such as ergostorel into the vitamin. So far X-rays have been considered as being too destructive, because most of the food, particularly the living cells, are destroyed when acted upon by the X-ray, but the zone of soft X-rays, apparently produces beneficial effects and rats having rickets (due to deficiency of vitamin D or of sunshine) are cured in about three weeks if they are fed foods that have been treated by soft X-rays. The length of time necessary to treat the ailment is comparable with treatment by ultra-violet irradiated foods. Further research will indicate the efficacy of this method.

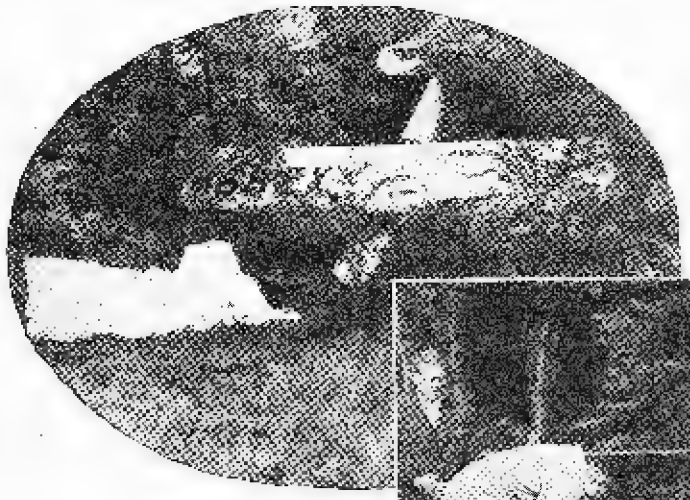
World's Largest Balloon Tire

THE largest balloon tire ever made put in its appearance in Los Angeles, Calif. recently. The tire is 12 feet in diameter and 4 feet wide. It is a regular super-twist cord tire, and differs from an ordinary tire only in respect to size. It can be inflated in 45 minutes, but the air pressure within is only 3 pounds. Comparison with the young lady standing on the supporting shaft gives one a good idea of the size.

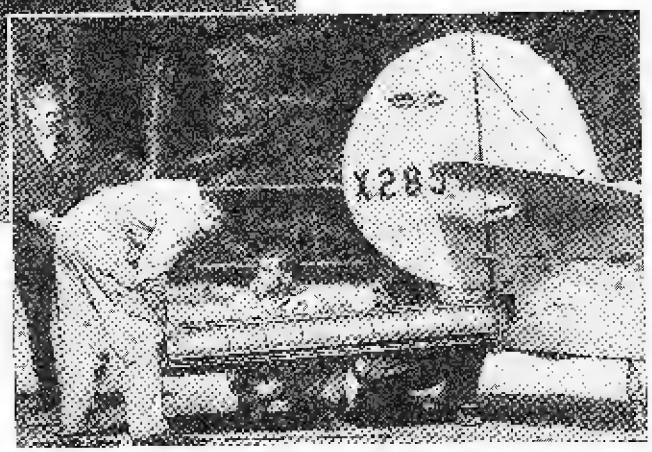


www.americanradiohistory.com

Landing Airplane Via Parachute



In testing a new type parachute for landing of planes, the plane came down in a clump of trees. No damage beyond a broken propeller blade was suffered.



Right—Mechanics loading a parachute contained within a metal tube in the tail of an airplane preparatory to the test.

CRIPPLED planes need no longer plunge to destruction, if they are equipped with a new style of parachute which was recently tested at Detroit, Michigan, and which proved successful. The parachute is contained within a large metal tube and is loaded into the tail of the plane. In case of disaster, the pilot needs only to pull a release cord whereupon a small pilot parachute catches the air and pulls the larger parachute from the tube. Heavy ropes of silk from the top of the plane support it on its earthward journey. In the first test, an airplane piloted by Vance Breese was brought to earth by the chute method. Although the plane landed in a clump of trees if suffered no damages beyond a broken propeller blade. Two stages of the experiment are shown.

Seeing the Inside of a Tornado

IT is very unusual for an individual to be in such a position that he could see inside of a tornado. Such good fortune befell Mr. Will Keller, farmer near Greensburg, Kansas, and is reported by Alonzo A. Justice, of the Weather Bureau Office of Dodge City, Kansas, in the Monthly Weather Review. Mr. Keller reports that while out in the fields, on June 22, 1928, looking over the ruins of his wheat crop, completely destroyed by a hail-storm, he noticed an umbrella shaped cloud in the west and southwest and suspected that there was a tornado in it. The air had that peculiar oppressiveness which always precedes the coming of such convulsion. A little later he saw not one but three tornadoes. He hurried his family into the cyclone cellar and while in the doorway, just about to enter, he decided to take a last look at the approaching storms. The lower end of one that had been sweeping the ground was beginning to rise so he felt quite safe. At last the great shaggy end of the funnel hung directly over head. There was a strong gassy odor and it seemed that he could not breathe. There was a violent hissing sound and looking up he found that he could look right into the heart of the tornado. There was a circular opening in the funnel, about 50 to 100 feet in diameter, which extended straight upward for a distance at least half a mile. The walls were rotating clouds and the hole inside was brilliantly visible because of constant flashes of lightning that would zigzag from side to side. Around the lower rim of the great vortex, small tornadoes were forming and constantly breaking away. It was these tornadoes that produced the hissing sound. Some of the small twisters rotated clockwise, others anti-clockwise. Something in the center that may have been a wind cloud was moving up and down.

Itacolumite, a Stone that Bends

A SLAB of flexible stone which can be bent by hand without breaking is now on exhibition at the Academy of Natural Sciences of Pennsylvania. This

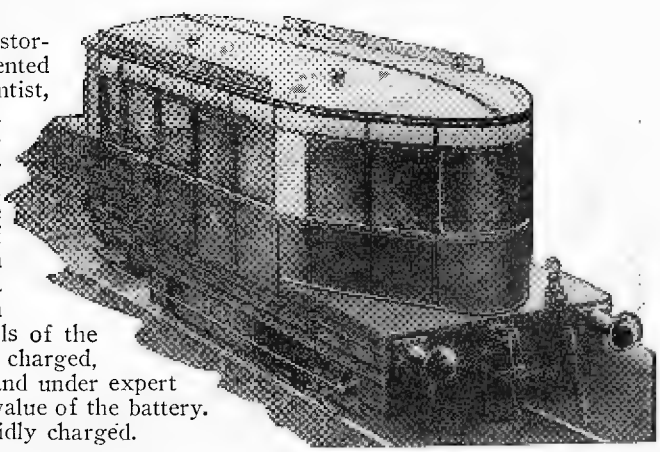
stone came from Brazil, but there are samples of flexible stone that can be found in North Carolina.

The Earth is Three Billion Years Old

ACCORDING to the conclusion of Dr. Otto Hahn, Director of the Kaiser Wilhelm Institute of Chemical Research in Berlin, the earth is three billion years old and for the past two billion years has been in a solid state. Dr. Hahn based his conclusion on a calculation of the amount of lead existing in the world. He believes that all of this represents uranium or thorium, the radio-activity of which substances has been completely extinguished. He has been able to determine how long it must have taken to produce the total amount of lead and based his calculations upon the knowledge of the laws of radio-activity. Only in recent years, namely the last 30 years, has man been able to calculate the age of this planet from these factors, because the laws relating to radio-activity were not known prior to that time. Due allowance is made for activities that may have taken place during the moulten period of this earth.

Storage Battery Drives Train at 35 Miles an Hour

A NEW electrical storage battery, invented by a young Irish scientist, Dr. James Drumm, had its first practical demonstration when a specially constructed coach was propelled by the battery on a stretch of the great Southern Railroad, Ireland, at a speed of 35 miles an hour. Although the cells of the battery were not fully charged, the tests out of doors and under expert supervision proved the value of the battery. The battery can be rapidly charged.

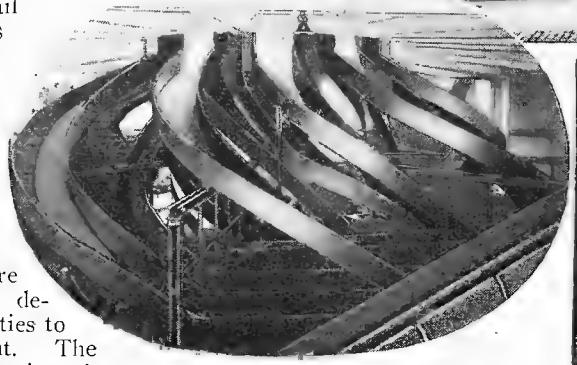


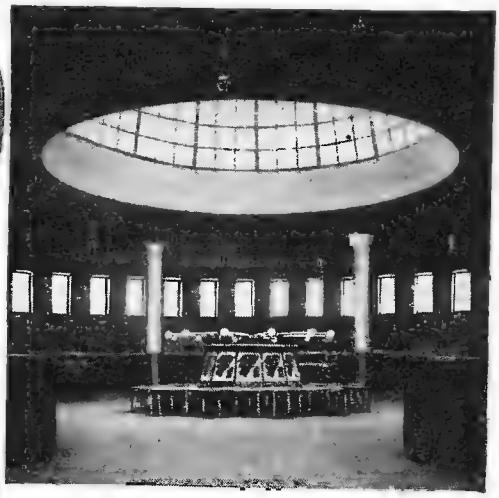
www.americanradiohistory.com

Germany's Mechanical Post-Office

THE latest parcel post sorting office in Munich is unique. Packages are brought in on trolleys to the entrance. They are then stamped and thrown into openings for the various districts, where they slide down ramps, are picked up by belt transmissions and are then transported to the exact loading platform where a mail van is waiting. The mail vans go to different districts of the city. The post-office itself is circular in shape, sorting is taken care of at the center and loading is around the circumference of the structure. This is merely a bit of efficiency not ordinarily found in the average post-office stations. The structure bids fair to expedite mail delivery in Germany's large cities to a very remarkable extent. The photographs present the interior view, as well as a picture of the exterior of the roundhouse.

Right—A view of the roundhouse—Munich, Germany's latest mechanical post-office.

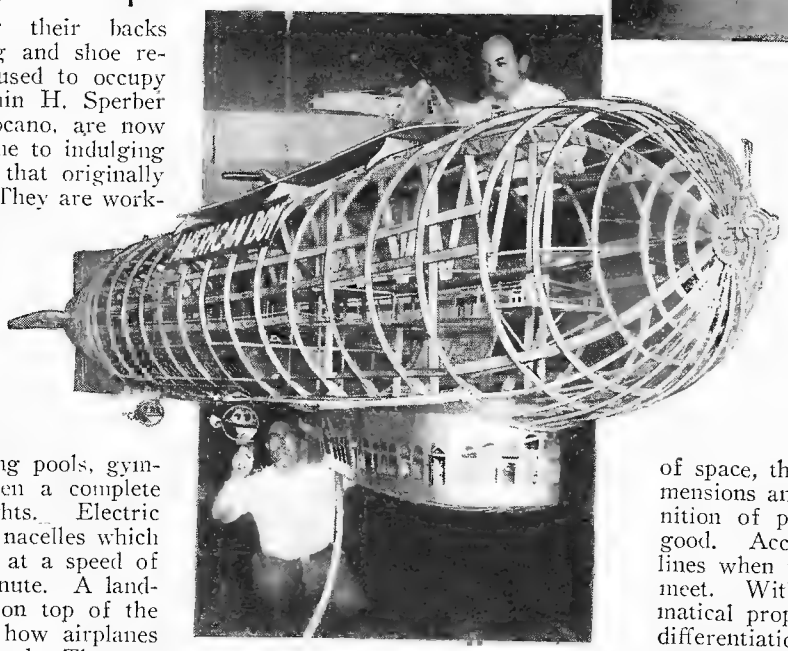




Above—The package chutes on the lower floor; and right, an interior view of the sorting room.

Build Large Airship Model

BLITHELY turning their backs upon the publishing and shoe retailing business which used to occupy their attentions, Benjamin H. Sperber (right) and George Tocano, are now devoting all of their time to indulging in the one great hobby that originally brought them together. They are working upon a large model of a Zeppelin which measures 21 feet from the nose to the tip of the tail. This model will be absolutely perfect to the finest details. Fittings and interior furnishings will be found in same. Provision is being made for swimming pools, gymnasium, lounges and even a complete system of electric lights. Electric motors are placed in the nacelles which will drive the propellers at a speed of 3,000 revolutions per minute. A landing platform is located on top of the dirigible to demonstrate how airplanes can be landed on this vessel. The men have used no other tools than a jig-saw, hammer and chisel.



Professor Einstein's New Theory

PROF. EINSTEIN who formulated the theory of relativity, has submitted to the Prussian Academy of Sciences a new treatise on the "Theory of Space Conceptions with Riemannian Metrics and Extended Parallelism." In this treatise he takes up certain non-Euclidian conceptions of space, those not limited to three dimensions and where the Euclidian definition of parallel lines does not hold good. According to Euclid, parallel lines when prolonged to infinity, never meet. With the help of the mathematical proposition, that in a series of differentiations the sequence of differences may be varied, Einstein deduces a principle governing the formation of compatible equations. He does not formulate a new general theory that can be compared with his relativity theory.

A Code Machine

THE latest authority in the world on codes and code machines has been discovered not at Scotland Yard but at the War Department at Washington, D. C. He is Major William F. Friedman, Chief of Signal Intelligence, here shown explaining to Miss Louise Newkirk, the intricacies of ciphering and deciphering machines.

Fourth Dimension a Hobby

DR. PAUL R. HEYL, a Bureau of Standards physicist, known throughout the field of science, as the man who weighed the world, is now putting wires together and making models to represent the fourth dimension. This task is chiefly for his own amusement, it is sort of a hobby. So far he has developed three models. One of them looks like a ball of popcorn, another like a set of triangles, all crushed together. Dr. Heyl's models will be preserved by the Bureau of Standards.

www.americanradiohistory.com

Making Maps by Machinery

WHAT gives promise to revolutionize the map-making industry is the system of map-making known as the Hugershoff Aerocartograph, recently introduced by the Aerotograph Corporation of America, in Washington, D. C. This mechanical means of making maps from aerial photographs produces drawings that are remarkably accurate and in perfect scale. The principles of construction of the Aerocartograph can be divided into three parts. The first is the measuring system represented by two photo-transits or inverted cameras coupled together symmetrically, the second is the optical system, consisting of lenses and prisms regulating the path of the light rays, and the third, the drawing system, constructed around a coordinate system.

The measuring system is the most important part of the instrument. As in a transit, horizontal and vertical angles are measured but instead of sighting the natural object, the operator observes a photographic image of the object. These photographs can either be terrestrial or group aerial photographs that are taken with an automatic aerial surveying camera shown in the top illustration. The photographs are so taken that they can be viewed stereoscopically. After the instrument has been properly adjusted, a pointer provides a reference mark by which the varying parallax caused by the changing relief of the country may be made visible. This point is the fused image of the two pointers, one in each eyepiece, which are rigidly fixed in the optical axis.

The advantages of aerial surveys are too well known to require recapitulation here. There is now added to these advantages simpler and more accurate map making.

Left—The Aerocartograph in use. With this instrument perfect maps drawn to scale can be made. Stereoscopic terrestrial or aerial photographs are used as the bases of the drawing of the map.

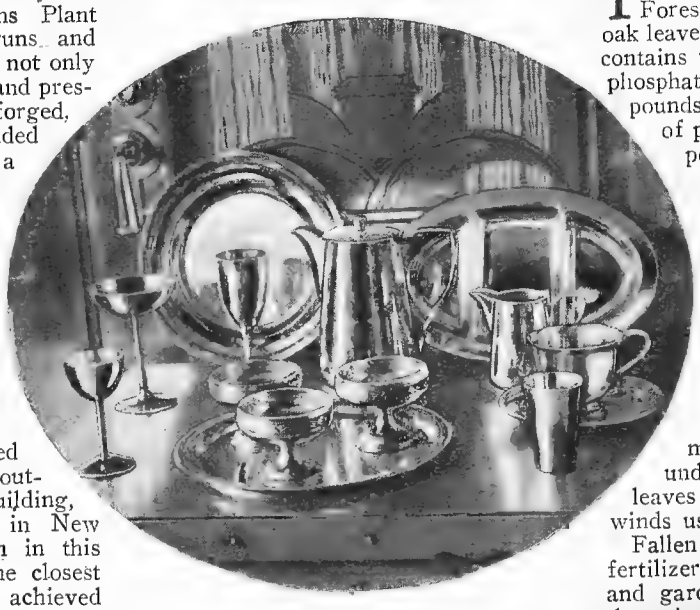
The upper photograph shows an automatic aerial surveying camera that is employed in the making of topographic surveys.

Right—An aerial photograph and the topographic survey made from this photo showing the elevations of the ground in the immediate vicinity. Examinations of the area enclosed in circles will indicate the great accuracy of the map.

Munitions Plant Makes Tableware

NIROSTA, a new alloy described as a high-chromium-nickel-steel alloy is now being turned out by the world-famed Krupp Munitions Plant of Germany, in place of guns and shells. The metal is said to be not only resistant to high temperatures and pressure but can also be rolled, forged, drawn, wire-drawn, spun, welded and take a finish giving it a mirror-like polish.

Watch cases, table service, dishes, wire screens, doors, kitchen utensils, dental fittings, cabinets, surgical appliances, trimmings for buildings, interior panelling, jewelry and building trimmings are but a few of the varied uses to which the metal has already been put. It is now also being employed as a metal decoration on the outside of the world's tallest building, the Empire State Building in New York. The tableware shown in this photograph is said to give the closest approximation to silver ever achieved with a composite metal. The wear is immune to discoloration from liquids or air and is slightly heavier than aluminum. The table top on which these pieces rest is made of the same metal beautifully etched and the door and trimmings which serve as a background are made of the same material but satin finished. The housewife will welcome such articles which do not have to be scoured to keep them clean.



Don't Burn Your Autumn Leaves

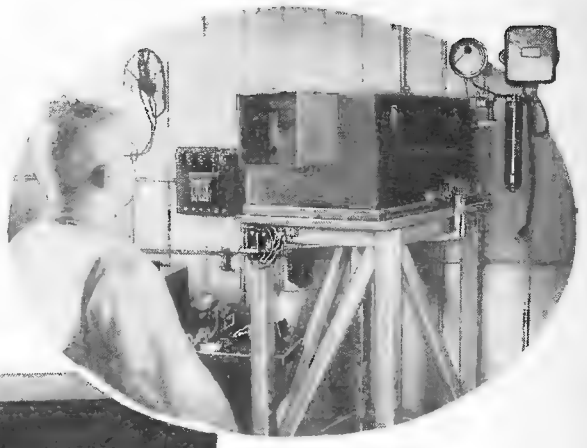
THE Pennsylvania Department of Forests has had analyses made of oak leaves and found that a ton of them contains two and four-fifths pounds of phosphate, eighteen and four-fifths pounds of nitrogen and seven pounds of potash, in addition to the indispensable humus or organic matter that is of even greater value than mineral foods. More than four dollars worth of valuable material is sent up in wasted smoke when an acre of leaf covering is burned. Not alone is worthwhile material removed from the ground but there is always a danger of fire because of sparks that may be blown into surrounding underbrush, or because burning leaves may be scattered by the strong winds usual in autumn.

Fallen leaves have a real value as a fertilizer and so have the stalk of plants and garden truck. What to do with them is sometimes a difficult problem particularly for the home gardener who does not like to see his gardens littered up with a lot of rotting leaves, but one can always deposit them in a pit.

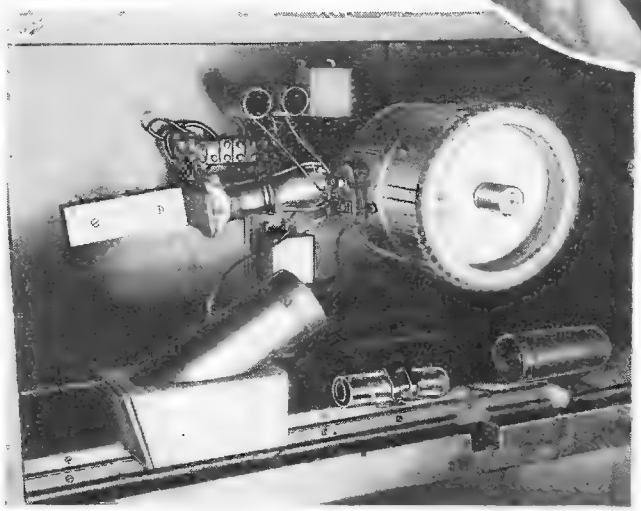
www.americanradiohistory.com

Promising German Television Tests

FOR some years past the well-known German Telefunken Company has been engaged in television experiments, working in cooperation with Professor Karolus, of Leipzig University, whose mirror drum method of scanning is familiar to students of the subject. During the past year the experimenters have made but few alterations in the actual television apparatus. Instead, they have concentrated on the solution of problems which are inseparable from the transmission of television by radio, especially on short waves. The frequency bands required for successful television are so wide that there is no room for them on the usual broadcasting wavelengths. There is plenty of room for them on the shorter waves, but fresh difficulties are immediately encountered in this region, due to fading, skip-distance, and double images. These problems and difficulties are more fully explained in an article by Mr. A. Dinsdale, who is an authority on the subject, in another part of this issue. By using special antenna systems which screened off the troublesome space-wave, excellent images were received between Nauen and Geltow, both near Berlin, and about 25 miles apart. A fifty-mirror drum was used, which divided the pictures up into 2,500 elements. At the speed of transmission employed, twenty pictures per second, the frequency band utilized was 50 kilocycles wide. Since the reception relied on the ground wave alone, only short ranges could be covered on the wavelength adopted, which was 70 meters. Tests are being continued.



Right—An observer seated before the television receiver watching test images sent over a distance of 25 miles. Details of the receiver are shown in the lower photograph. A mirror drum fitted with fifty mirrors is employed in conjunction with a crater type neon lamp which projects an intense beam of light upon the revolving mirror drum, whence it is reflected on a screen.

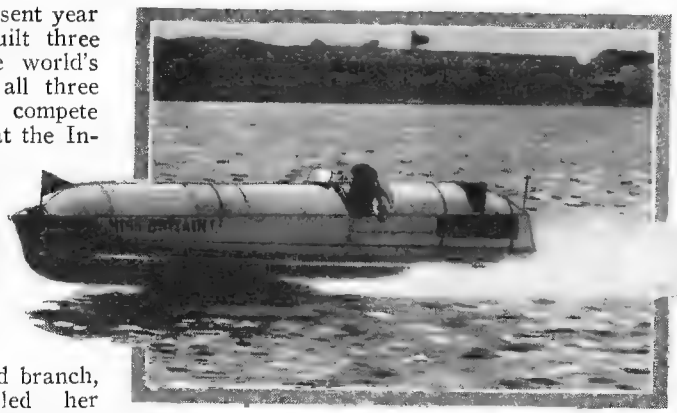


A Revolutionary Auto

IT would appear that we are only just beginning to realise the principles and value of streamlining as an aid to speed. Sir Dennis Burney, designer of the British airship R-100, has just astonished the automobile world by demonstrating a new motorcar, the body of which is shaped like an airship, and which is capable of greater speed as a seven passenger sedan than as a stripped chassis. It is reported that the "Burney Streamline" suggests the R-100 vividly, having a low front scarcely higher than the wheels, sloping windshield and a long tapering tail extending far beyond the rear wheels. Sir Dennis has also carried out another revolution by placing the engine at the rear of the chassis. The result, according to those who have traveled in the new vehicle, is that the speed is increased, while noise, heat and fumes from the engine are eliminated and the interior of the car is cool and silent.

Greyhound of the Seas

DURING the present year Britain has built three boats to attack the world's speed records, and all three were expected to compete against Gar Wood at the International Trophy Races at Detroit. The first of these, Miss England II, after passing the 100 M.P.H. mark on Lake Windermere, one of England's beauty spots, fouled a waterlogged branch, capsized, and killed her courageous driver, Sir Henry Segrave. And with his passing, England lost a very gallant gentleman. The second boat, driven by Miss Betty Carstairs, survived her initial tests, but was beaten by Gar Wood at Detroit, achieving a speed of about 95 M.P.H. The third boat, illustrated here, and christened Miss Britain I, was designed by Hubert Scott-Paine, who is seen here driving her at full speed on Southampton Water in a preliminary trial. Miss Britain I competed in an entirely new class, the 5½ litre class, and won the Detroit News International Trophy for that class, at a speed of over 50 M.P.H. The boat has several revolutionary features in her design, hull and rudder.



Moon's Temperature Measured

AN instrument known as a thermocouple, which is so sensitive that, in a vacuum, it can detect the heat of a candle at a range of 100 miles, has been used by scientists of the Carnegie Institute to determine the maximum temperature of the moon. Careful observations with this instrument have revealed that the moon's maximum temperature at mid-day is 244 degrees Fahrenheit. A thermocouple acts on the principle that any heat falling on the junction point of two dissimilar metals will produce an electric current.

New German Phone Records Spoken Messages on Ticker

ACCORDING to a Berlin report, the German Ministry of Posts and Telegraphs has developed the ideal telephone alibi eliminator. The new instrument not only transmits the voice but records automatically and simultaneously all spoken messages on a ticker tape connected with the ordinary telephone by a special wire. Several advantages are claimed for this new device, the most important being that all telephone messages will be recorded during the subscriber's absence, or feigned absence. Another advantage is that in the event of it being impossible to understand a distant speaker, owing to a faulty wire, it will be possible to transmit the message on the ticker. Important letters and documents could also be transmitted in this way, and discussed simultaneously. How soon the new instrument can be installed depends upon when the Ministry makes its installation obligatory, thus facilitating mass production, upon which its value depends.

www.americanradiohistory.com

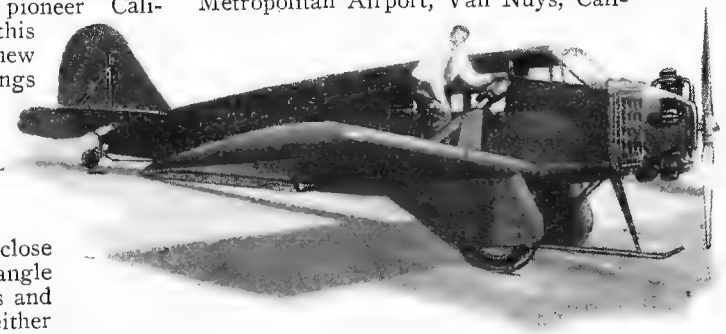
A Sail-Bike for the Seashore

WHY pedal your bicycle if you can let the wind do it. At least, that was Miss Eleanor Gibson's idea and accordingly she provided her bicycle with a sail. And every day she goes for a ride along Oceanview Beach, Virginia, under power derived by the sail attached to the front fork of her bicycle. The photograph indicates that the contraption is of simple construction, merely an upright and a cross member. A pocket made in the sail, at the apex holds the sail in position at the top. It is laced in one place near the midpoint and again to a cross member mounted just above the handle-bars. The bicycle is steered in the usual way and when it is desired to run directly into the wind, recourse may be had to the pedals or the two-wheeled land sail-bike may be tacked against the wind. For those who have a nice sandy beach, a duplication of this effect will add many hours of pleasure to their vacation period. Any light material can be used in the construction of the sail and the bamboo pole is easily purchased.

This Plane Changes Its Wing Angle

WHAT is claimed to be a fool-proof plane is the creation of Waldo Waterman, a pioneer Californian aviator, seen in this photograph with his new construction. The wings of this plane are adjustable from the pilot seat. In other words, whenever the pilot desires he may change the dihedral angle.

The wings are hinged close to the fuselage. Their angle is varied by air cylinders and pistons, one located on either side of the fuselage. Mr. Waterman has his left hand on one of these cylinders. It is claimed that by the proper regulation of the dihedral angle, the plane rises much easier in bumpy air. This photograph was taken at the Metropolitan Airport, Van Nuys, California, where the plane was first exhibited.



Forehead Headlights

GERMANY seems to be developing electrically-lighted reading glasses with great rapidity. Here is another recent German invention. Two cone-like devices are attached to the eye-glass frames and are fitted with small incandescent bulbs and lenses. The light is directed on the paper that is being read. Flashlight batteries contained in the vest-pocket supply current. These devices are of advantage to the dentist or surgeon.

An Engine for Gliders

MANY attempts are being made to build small airplane motors which can be attached to gliders and which will keep gliders in the air even if the motors are not sufficiently powerful to lift the plane off the ground.

Here we find a tiny ten horsepower motor which its inventor Lee Bowman, of Los Angeles, California, expects will transform the thousands of gliders now in use in America, into practical "mosquito" planes. Mr. Bowman, is the creator of the Dawn Reciprocating Aircraft Motor. This engine, with an open throttle, has a gas consumption of two quarts an hour. It will turn the propeller at 1560 revolutions a minute and will offer transportation at a cost considerably less than in an automobile. Perhaps these motors will soon startle people into becoming air-minded.

A glider equipped with such a power unit would, of course, have to be launched into the air in the usual manner. Once in the air, the motor would keep it there and enable a flight in any direction to be achieved.

How Psychology Reduces Automobile Accidents

ONE man in every twelve sent to the garden to pick tomatoes probably will return with green ones as well as red ones, because all tomatoes look alike to him, and when he is driving an automobile, he naturally tends to confuse red and green signal lights.

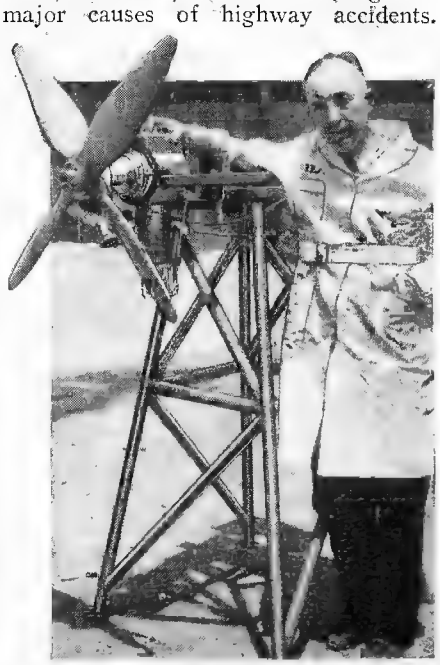
This conclusion was announced by Dr. Walter V. Gingham, Industrial Psychologist of the Personal Research Federation of New York, in a talk over the Columbia Broadcasting System arranged by Science Service on "How Psychology is Reducing Automobile Accidents."

Women and girls have the advantage over men in this regard, Dr. Bingham said. He did not ascribe this to their greater familiarity with vegetables, but to the fact that "not nearly so many of them are color blind."

Psychologists have come to the rescue of the color blind driver, however, Dr. Bingham explained, "cooperating with safety engineers in standardizing the colors to be used in highway signals. They have found the particular hues of red and green that are least apt to be confused, even by drivers with this color defect. They have also undertaken to arrange these signals so that even the color blind eye can readily tell them apart by their shape, position or number."

But in another respect Dr. Bingham found men drivers superior to women. He said: "Women have fewer accidents than men, but this is not because they are better drivers on the average. It is because they do not do so much driving. When men and women have the chance to operate the same kind of a vehicle, over the same streets, for the same number of hours a day, the women have about three times as many collisions as the men.

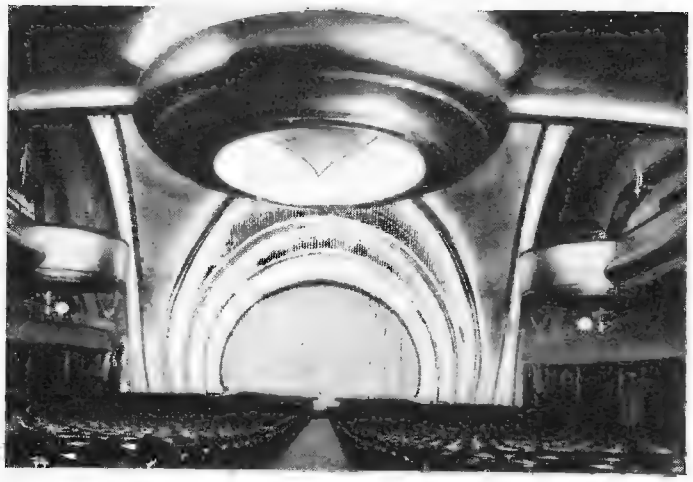
"Color-blindness and other visual defects, however, are not among the major causes of highway accidents.



www.americanradiohistory.com

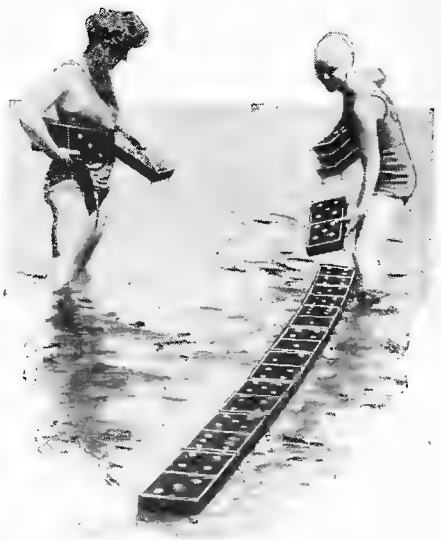
Theatre of Unusual Beauty

THEATRES in Germany are being built as beautiful as amusement palaces in any part of the world. This photograph taken of the interior of a motion picture theatre at Berlin, known as Titania, shows some of the beautiful and striking effects which Germany is putting into her amusement palaces. Huge arches or curved members span the theatre from side to side and end to end, and an archway to which these curves seem to lead forms the proscenium of this glorious theatre. Semi-indirect lighting graces the interior given by a most unusual lighting fixture in the center of the theatre, and the indirect illumination can also be seen.



Water Dominoes

A NEW surf sport has been introduced at Catalina Island, by Loretta Young, screen star, and Helen Bell, her friend, which is called "Water Dominoes." The dominoes themselves are made of balsa-wood, the lightest wood known. They are therefore easily transportable. Small hooks hold them together. The game was not in progress.



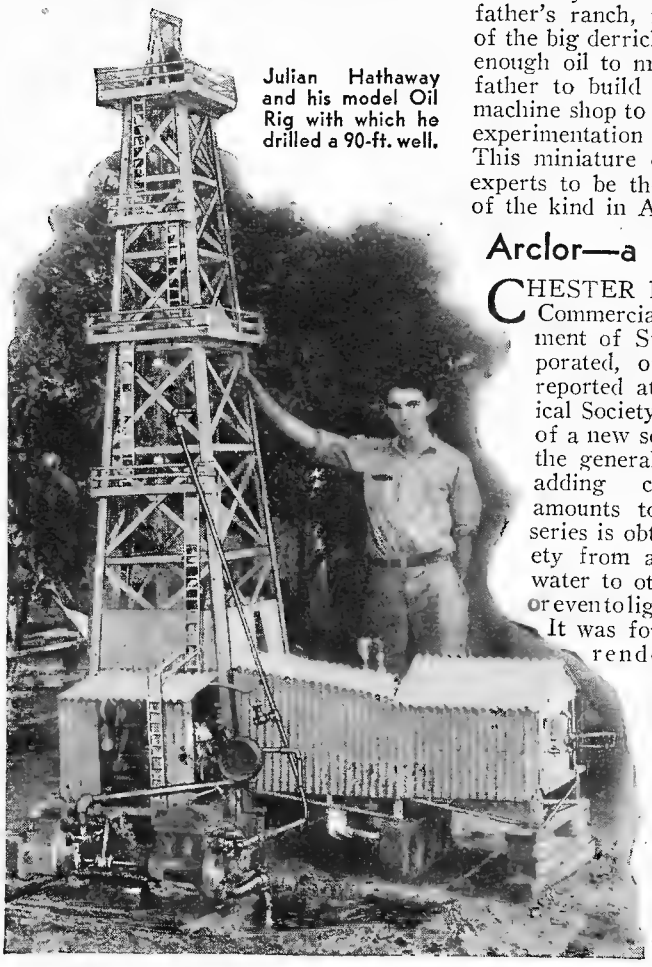
A New Water Sport

A NEW water sport which has become popular at Lausanne-Ouchy, on Lake Geneva, Switzerland, has recently been introduced. As the photograph illustrates, a single rod projects from the top of a large rubber ball. On either side of this rod, one can see the rungs which convert the upright into a sort of a ladder. The object of the sport is to see how high one is able to climb before the ladder tilts. If the fan does not preserve his balance carefully, he must either jump off the ladder or get a ducking.

This enthusiast lost his balance. In another moment he will get a ducking.

A Baby Oil Derrick That Works

A BABY oil derrick that is complete even to a small steam engine and a pumping plant has just been completed by Julian Hathaway, a 16-year-old boy, of Norwalk, California. This construction is now being displayed by the General Petroleum Company, in whose field it was built. The derrick itself stands 9 ft. tall and is of all metal construction. The steam engine at the base, the pumping plant and rigging are exact replicas of the Black Giant's derricks that dot the California landscape. In an effort to prove to himself that he had not built a toy, young Hathaway bored a 90 ft. hole on his father's ranch, right alongside of one of the big derricks. This brought forth enough oil to make it possible for his father to build a completely equipped machine shop to be used for the further experimentation of his inventive son. This miniature derrick is declared by experts to be the most complete model of the kind in America.



Julian Hathaway and his model Oil Rig with which he drilled a 90-ft. well.

Arclor—a New Chemical

CHESTER H. PENNING, of the Commercial Research Department of Swann Research, Incorporated, of Anniston, Alabama, reported at the American Chemical Society meeting the discovery of a new series of products under the general name of arclor. By adding chlorine in various amounts to diphenyl, the arclor series is obtained, ranging in variety from a substance resembling water to others thick and syrupy, or even to light amber-colored solids. It was found that this substance renders wood practically fireproof and does the same to textile fabrics. The product also makes excellent insulators and will have various applications in the making of adhesives, printing inks, artificial leather, leather finishings, sealing waxes, chewing gum and others.

What Happens in an Automobile Engine

THE Research Laboratories of the General Motors Corporation have been able to remove samples of gas from an automobile cylinder at different points during the fraction of a second taken for the stroke and following ignition. These samples analyzed by chemists trace the progress of the combustion wave and provide a picture of the invisible action in the engine.

www.americanradiohistory.com

New Rowmobile

A NEW land-skiff was recently seen in action for the first time at Herne Hill in England. This new skiff or hand-operated one-seater quadri cycle car is shown here being operated by Miss Gracie Fields. As will be observed, the apparatus is handled like a rowboat. A cloth webbing belt is taken up by a spring and clutch drum mounted on the front axle and when the handles are pulled motion is imparted to the front wheels.

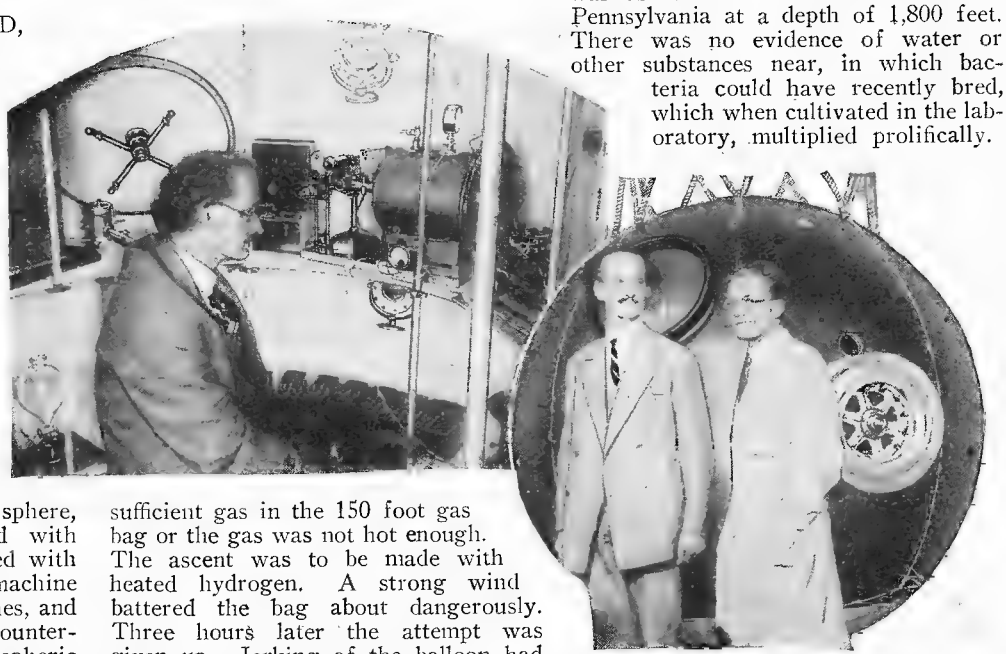
Living Bacteria Found in Coal

HARD coal bacteria which appeared to have lived for millions of years locked in masses of anthracite, probably when the coal was first being formed, were found by C. B. Lipman, of the University of California, who described the discovery to the National Academy of Science at a recent convention in Berkeley, California. Dr. Lipman was seeking further light on the origins of living bacteria which he discovered more than a year ago in what is known as pre-Cambrian rocks. These rocks are usually estimated at more than 200,000,000 years old and are the earth's oldest rock. The bacteria that were discovered are either elongated or egg shaped. The elongated form are brilliantly iridescent. The coal referred to was obtained in the Pottsville area in Pennsylvania at a depth of 1,800 feet. There was no evidence of water or other substances near, in which bacteria could have recently bred, which when cultivated in the laboratory, multiplied prolifically.

Plans to Rise 52,000 Feet in a Balloon

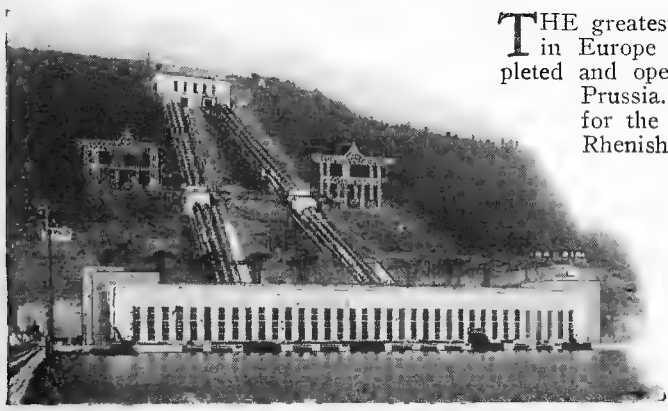
PROF. AUGUSTE PICCARD, physicist of the Brussels University and his assistant, Charles Kipfer, are planning a visit to the stratosphere, the upper layer of the air, in a free balloon, that is provided with a large hermetically closed ball-like gondola, made of aluminum and equipped with all sorts of scientific instruments. An attempt will be made to reach an altitude of 52,000 feet where measurements of radio-activity, and the ionization of air will be made and cosmic rays will be studied. The balloon itself is unusually large and contains 18,000 cubic yards of specially treated hydrogen. The aluminum sphere, in addition to being equipped with scientific instruments, is provided with oxygen tanks, an air-making machine similar to those used in submarines, and contains heating apparatus to counteract the extremely low stratospheric temperatures which are believed to be in the neighborhood of 66 degrees below zero Fahrenheit.

In the first attempt made at Augsburg, Germany, on September 14th of this year, Prof. Piccard and Mr. Kipfer entered the cabin of the balloon and screwed fast the airtight manhole cover. For some reason or other the balloon failed to rise, probably there was not sufficient gas in the 150 foot gas bag or the gas was not hot enough. The ascent was to be made with heated hydrogen. A strong wind battered the bag about dangerously. Three hours later the attempt was given up. Jerking of the balloon had damaged a few of the delicate instruments, but these will be speedily repaired. Even if Prof. Piccard had thrown away some of his ballast he probably could not have risen to the desired height. It may be necessary for him to wait until a long and continued period of high pressure develops. Scientists will look with interest to any data which this experiment gives.



Above—Prof. Auguste Piccard and his assistant, Charles Kipfer, standing outside of the aluminum sphere of their balloon which will attempt an ascent to the stratosphere. Diagonally to the left—Prof. Piccard inside the aluminum sphere with his outfit of scientific instruments.

Europe's Largest Hydro-Electric Power Plant



THE greatest hydro-electric plant in Europe has just been completed and operated in Westphalia, Prussia. Much of the capital for the building of this new Rhenish-Westphalian Electric Works was loaned by American financiers. The cost was many millions of dollars. The giant plant will generate about 160,000,000 kilowatts. The water which propels the turbines flows through four gigantic steel tubes, each 160 meters (about 500 feet) long, and passes down into the generating room which is considered to be the last word in mechanical construction. Above, there is a reservoir which has a capacity of 1,500,000 cubic meters, about two million tons of water.

This photograph gives a general view of the great new power plant and shows the four tubes leading down to the generating room of the 240,000,000 horse power unit. Switzerland has long held preeminence in hydro-electric power. Now Germany and Italy are rapidly coming to the front.

www.americanradiohistory.com

Testing Roads in the Laboratory

By Hamilton M. Wright

A laboratory wherein materials used in road-making are checked up and tested for the Government and State Highway Departments.

CHUNKS of road coming in cigar boxes from all sections of the country are daily being stretched to the size of human hairs a meter long to test the ductility of the road surface in a great laboratory in Boston, where men far advanced in the fields of science are performing the most extraordinary and strangely interesting experiments ever known in the history of road building.

The importance of the ductility test, which is but one of many, can be illustrated by the fact that upon its ductility depends in no small measure the ability of a road surface to react without breaking to the repeated shattering impacts of heavy trucks and automobiles.

The samples arriving at the laboratory are sawed in two. They are cooked, separated into their constituent parts, weighted, bathed in warm water, punched by needles, drawn into hair lengths, or pounded by hammers, and whirled about in steel cylinders. Even the dust from the rock is weighed to determine its abrasive qualities when wet and when dry.

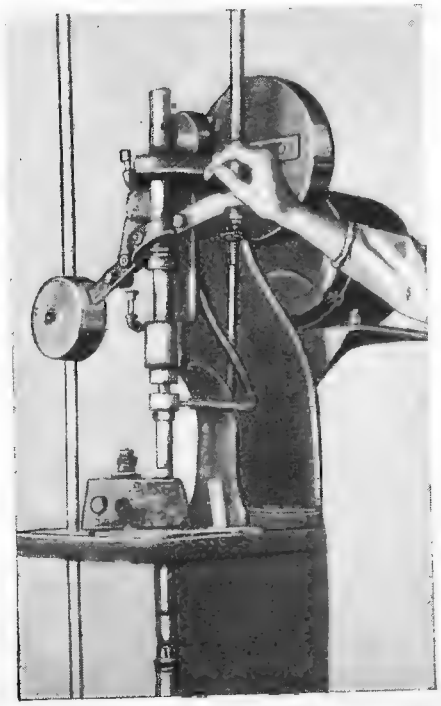
Road samples, baked to loosen up the material, and mixed with a solvent, are placed in a receptacle and revolved at high speed, throwing out the dissolved asphalt through a porous filter ring or washer. The asphalt, thus freed from other materials, is then tested for ductility, consistency, etc.

In witnessing the meticulous care taken in conducting these experiments one is reminded of the operating rooms in a great hospital where fine needles, delicate hands, keen eyes and a score of almost humanly supersensitive instruments are put to work. The billion dollars spent annually on roads in the United States is money that is literally laid upon the ground never to return except in the form of economical transportation, and only a knowledge to the last degree of a road's lasting qualities can determine the justification of this expenditure. A staff of experts, working under the chief of the scientific staff of the Warren Brothers laboratory in Boston, has gone further into the testing of road surfacing than most men have in the fields of radio, aviation or other related developments. For over thirty years they have been performing those meticulous tests and few outside of the laboratories are aware of the marvels performed therein.

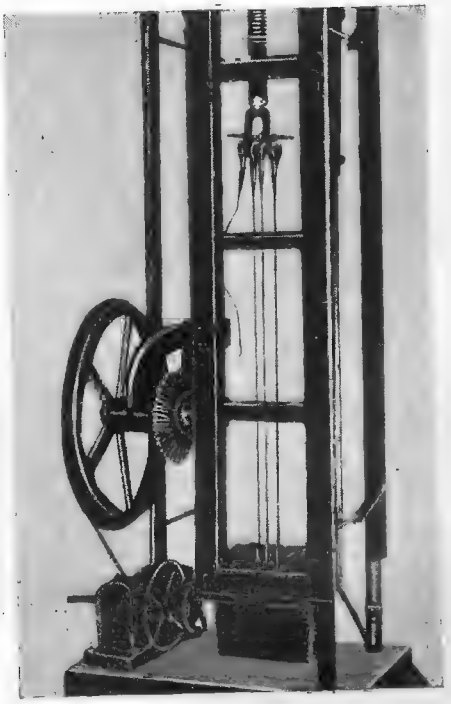
How a Road Sample Is Tested

The road sample that comes for a test is a representative section of work being laid in some part of the country, and it must come up to the standards of Warren Brothers Company or the road from which it came is torn up and another stretch laid down.

The sample, consisting of asphalt mixed with stone and sand, is put into an oven and cooked to (*Continued on page* 754)



A sample of rock being bored into cylindrical shape ready for shock tests. Repeated blows from a mechanical hammer increase in force until the rock finally breaks up.



The ductility testing machine. Asphalt, after being separated from other materials, is heated to 77° Fahrenheit and gradually drawn out to hair lengths a meter long.

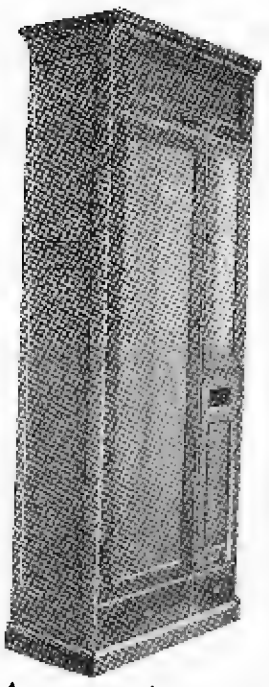
www.americanradiohistory.com

A Built-in Wardrobe

How to Make a General Utility Closet

By H. L. Weatherby

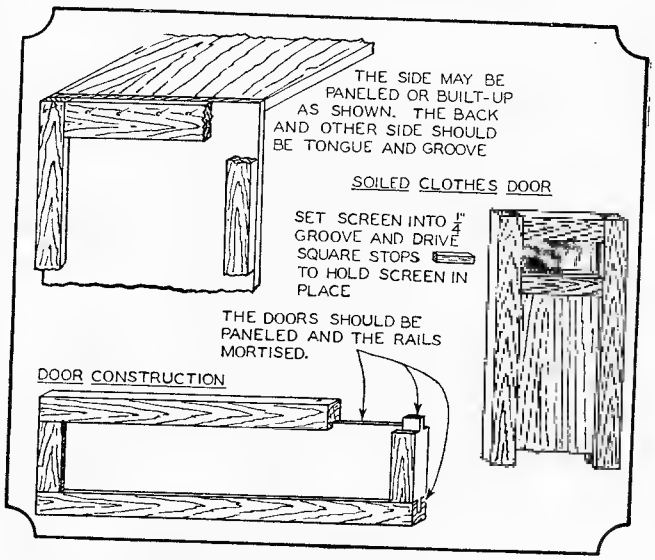
Director of Manual Training, Montgomery County Schools, Montgomery, Alabama



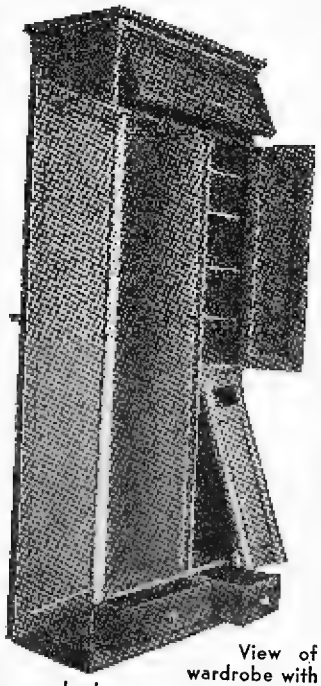
A compact and attractive looking wardrobe.

WE will venture to assert that there are a million homes in America today with inadequate parking space. What has all of this to do with built-in wardrobes, you ask? We are not trying to discuss a new phase of the traffic problem, and the statement made has nothing to do with the family bus, but rather with the parking of the family clothes. Closet space, it seems, is always at a premium in our homes, and this is particularly true of the dwellings built in years gone by. Today, architects are planning more and more conveniences for the home. When closet space cannot be made available in the bedrooms without sacrificing other things, wardrobes and dressers are built-in. The properly planned and built house of today will be largely sufficient unto itself and its occupants, and a minimum of store-bought furniture will be necessary.

There is the large class of home occupants (we will not say home owners, for so-called built-in furniture can be moved), who need more clothes space to whom this article should appeal. Then there is the great group of people who are building their own homes, or who are planning to do so, to whom every dollar counts, and who are having to cut out little features or conveniences because they "run into money." Half the fun in having a new home of your own also comes in doing part of it yourself, and even if the house is not finished when you move into it, there is always the pride that goes along with anything that you build as a part of it, besides the big saving in money. A large part of building cost is that of labor; and removing the labor cost of the article of furniture illustrated, which we call a wardrobe for want of a better name, the total cost should not exceed six or seven dollars.

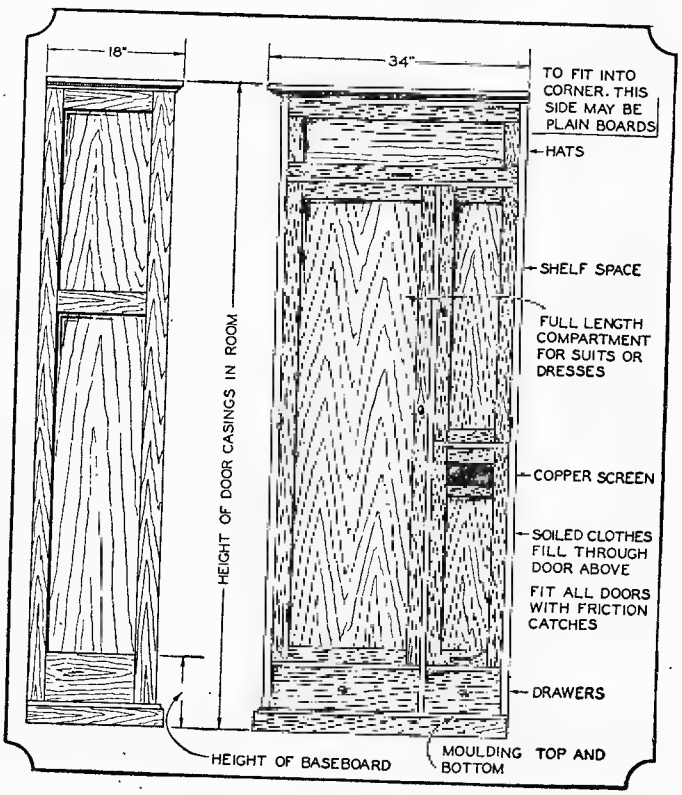

THE SIDE MAY BE PANELED OR BUILT-UP AS SHOWN. THE BACK AND OTHER SIDE SHOULD BE TONGUE AND GROOVE
SOILED CLOTHES DOOR
SET SCREEN INTO 1/4" GROOVE AND DRIVE SQUARE STOPS TO HOLD SCREEN IN PLACE
THE DOORS SHOULD BE PANELED AND THE RAILS MORTISED.
DOOR CONSTRUCTION

Above—Constructional details. Below—Side and front elevations.



View of wardrobe with doors and drawers open, showing shelves.

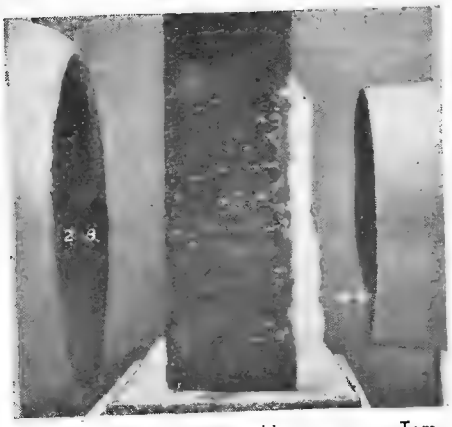
The wardrobe need not be built-in actually, although if that proves to be the easier way there is no reason why it should not be done. It can, however, be built up quite as well in the shop and moved to the room where it is to be used. The material should match the trim in the room, if possible, and be finished in the same way. The height should be the same as that of the door casings, which is fairly uniform and of about the height indicated in the drawing. The baseboard should be considered in relation to the bottom part of the case, and in every way it should be planned to fit the room in which it is to be. (*Continued on page 752*)



www.americanradiohistory.com

Ice Shuns Sweetened Wings

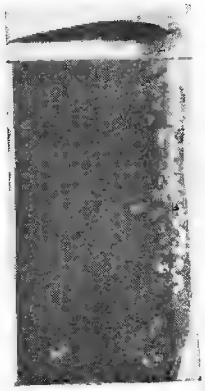
By Don Charles

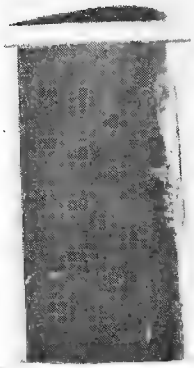


Test on glucose coating. Heavy spray. Temperature -1°C. Air speed 70 M.P.H. Upper surface.

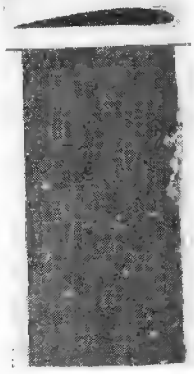
Test on glucose coating. Heavy spray. Temperature -1°C. Air speed 70 M.P.H. Profile.

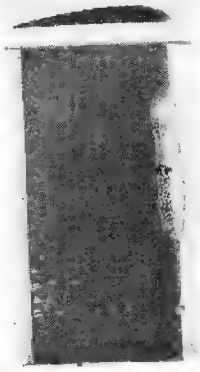
The Formation of Ice on Aircraft in Flight Presents a Serious Hazard. The Danger Arises Partly From the Increased Weight, but More Particularly from the Deformation of Aerodynamic Shapes Resulting in Decreased Lift, Increased Drag, Excessive Vibration, and Finally Loss of Control. The Wings, Wires and Struts Are the Parts Most Seriously Affected. Soluble Compounds Such as Corn Syrup Are Found to Give Best Results When Applied as an Anti-Ice-Formation Dope.





Above — Wind tunnel test on wing surface covered with heavy oil coating. Heavy spray. Temperature -1°C. Air speed 70 M.P.H. Note heavy ice formation. Right —Test with glucose coating. Lightspray. Temperature 0.5°C. Air speed 70 M.P.H.





Above — Wind tunnel test on wing surface covered with glucose coating. Light spray. Temperature -1°C. Air speed 70 M.P.H. Ice formation moderately heavy. Left—Test with "karo" syrup coating. Light spray. Temperature -4°C. Air speed 70 M.P.H.

ONE of the most deadly foes that the aviator has to meet is Old Man Weather, particularly when sudden cold covers wings, struts, and controls with ice.

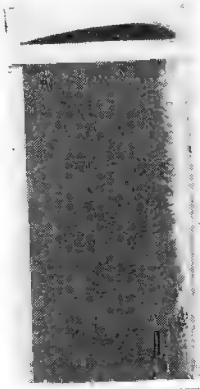
No one knows for a certainty how many serious accidents, crashes and casualties have been the result of the sudden formation of ice on aircraft in flight, making the plane unmanageable.

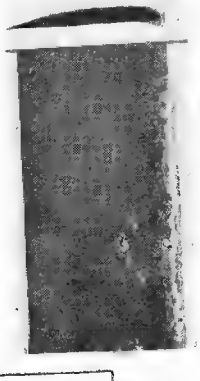
Air mail and transport lines, flying in all weather, at all times, have sought in vain for some sort of method that would prevent the formation of ice. Recently, at Langley Field, near Washington, the proving ground of the National Advisory Committee in their study of aeronautics, the great wind tunnel was connected with a large refrigerator unit capable of blowing intense cold air against the wings of planes.

The search was for some sort of coating that might be applied to the airplane before it left the field which would discourage the icy blasts of Old Man Weather.

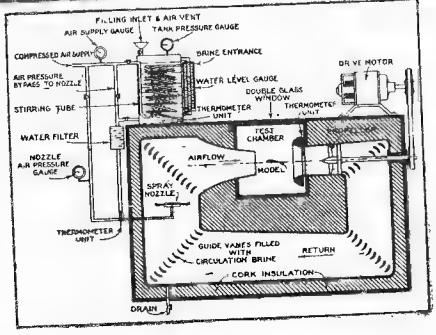
Aviation engineers have long sought for methods that would overcome the ice hazard. There appeared to be two general ways which might prove satisfactory. One is prevention, which includes the use of surface applications and the use of heat which will prevent ice forming. The second is avoidance, which includes adequate weather forecasting over air routes and the use of suitable instruments to enable pilots either to stay on the ground or to fly around or above a storm area.

But the mails must go through, regardless of the weather. Hence scientific engineering determined to discover, if possible, a way of discouraging the ice from sticking to the wings, the wires and the struts and other parts.





Left — Test on glucose coating. Lightspray. Temperature -6.3°C. Air speed 70 M.P.H. Ice formation heavy. Right — Test on heavy oil coating. Light spray. Temperature 0.5°C. Air speed 70 M.P.H. Moderate ice formation. Below—Diagram of refrigerated wind tunnel.



The first, known as temperature inversion, is a condition that exists during an ice storm. Such a storm brings about the sudden appearance of ice on exposed parts. The ice is smooth and glassy in appearance. (*Continued on page 765*)

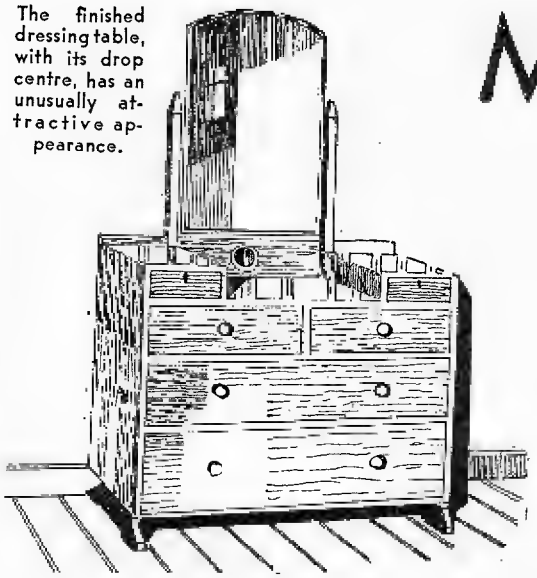
This problem proved far more complex than it sounded and has exacted much research. The behavior of water when subjected to sudden changes in temperature is quite well known, but a plane suddenly dashing into a cold area cannot stop, and its very speed is adapted to the sudden appearance of ice.

There are three general atmospheric conditions which cause three corresponding types of ice formations on airplanes. These are temperature inversion, mild and high supercooling.

www.americanradiohistory.com

Making a Compact Dressing Table

By J. E. Lovett



The finished dressing table, with its drop centre, has an unusually attractive appearance.

IN the dressing table of our blue oak bedroom suite an unusual feature is the drop centre with a jewel drawer on either side; the mirror is of the frameless type.

The carcase ends (Q) (see Figs. 1, 3 and 4) should consist of prime quartered oak, preferably straight grain. The bottom (O) might be of whitewood or cheap deal with a lipping of 1 in. oak on the front edge. The timber for the midboard (H), wing ends (N) and tops (L) might also be of quartered oak. Straight grained oak should be first choice for the drawer rails (I), to prevent curling or twisting when in use.

The ends are lined up on the front edges by the clamps (M), this course being adopted to avoid the drawer sides and ends binding. This clamping will mean a tongue being worked on the front edges and a corresponding groove on each edge of the clamps as shown in section in Fig. 3.

Either of the two methods illustrated in Fig. 5 might be used for jointing the ends, wing tops and ends (N).

The lap dovetail is of course far simpler to cut than the mitre dovetail, inasmuch as it saves the work of two mitres which must come together above the dovetails. On the other hand, the argument in favor of the mitre dovetail is that it hides the end grain.

The dovetails might first be fitted up dry and then knocked apart, as further constructive work has to be carried out on the ends (Q). A rebate will be needed on the bottom edge of each end for the bottom board (O), and also on the back edges for the carcase back, these details appearing in Figs. 3 and 4.

The end clamps (M) must be mortised for the tenons of the drawer rails, and a rebate must also be trenched out across each of the ends (Q) for the midboard (H), these grooves being ¾ in. to fit the corresponding mortises. A small tenon might also be used on the bottom board, and could be screwed up through when fitting the carcase.

The mid-board (H) is grooved across grain in three places: two on the top face for the end (N) and one on the under face for the drawer division. These grooves are allowed ¾ in. in width and a depth of 3/16 in. (see Fig. 3).

The division clamp is allowed a ⅜-in. tenon into the mid-board and also into the drawer rail. Grooves to a depth of ⅜ in. will be needed on the inside edges of the drawer rails for the dust-boards, as in section Fig. 2. The main carcase can now be glued and clamped up, not forgetting the division clamp.

The blocks (or feet) might next be shaped up and slot-screwed to the carcase bottom to allow for shrinkage (Fig. 2). These might be in birch for ebonizing, or preferably in solid blackwood, this being the commercial name of dyed sycamore.

The drawer runners might next be fitted to the (*Continued on page 757*)

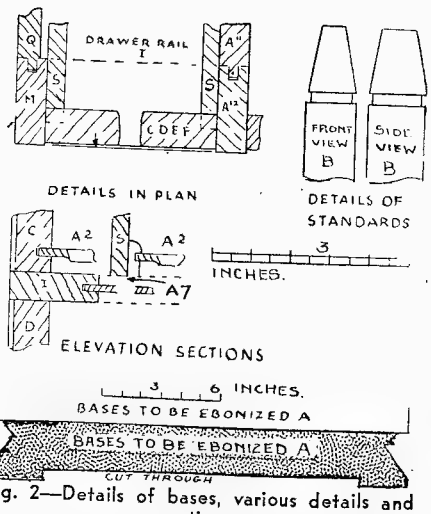


Fig. 2—Details of bases, various details and sections.

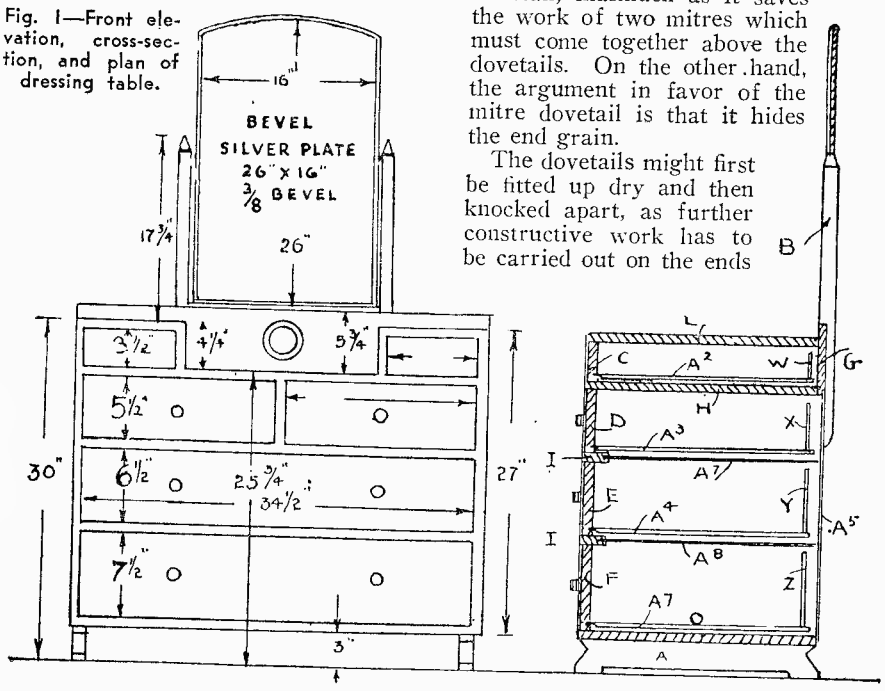


Fig. 1—Front elevation, cross-section, and plan of dressing table.

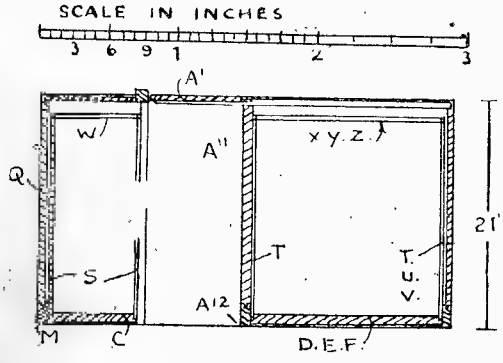
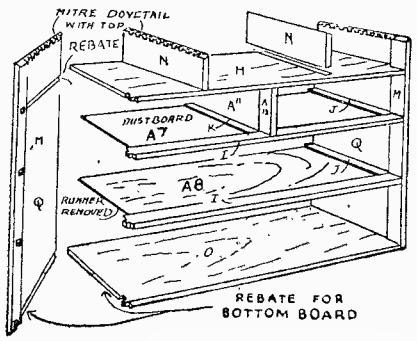


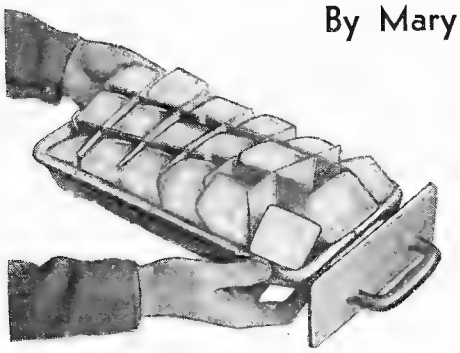
Fig. 3—Sketch, showing details of assembly of top, bottom, sides and dust boards.



www.americanradiohistory.com

Scientific Aids to Your Comfort

By Mary Jacobs



A Flip Brings a Cube!

HOW annoying it is to hammer on the back of the steel ice cube tray to dislodge one or two cubes, and then have the tray's entire contents fall out.

The surprising thing is that no one thought of this rubber tray, equipped with a steel reinforced handle, before. A flip of the fingers will eject all cubes. A few can be released by removing the container partly from the refrigerator, and pressing downward on the handle. To date, the trays have been made to fit only special-size electric refrigerators. The device has been tested by us.

TIRED of your weekly visit to the beauty parlor for a marcel wave? Then buy your own little marcelwaver. The contrivance itself, with an attachment for use where electricity is not obtainable, cord and plug, hair lotion, and book of directions costs about $6.50. With this little instrument, you can experiment till you find the wave most becoming to you. Attach the plug to a convenient outlet, and apply the hair lotion. Then adjust the appliance and start operations. Our suggestion is to have someone help you until you become fairly proficient. Tested in our laboratory.

No More Shadow Shaving

AT last . . . an illuminated medicine cabinet, equipped with adjustable lights. Wires to connect these sliding lights with the outlet are led around inside the door casing. Lamp brackets slide in a slot along the edge of the mirror at the touch of the finger; self adjusted friction clamps prevent their slipping. The door is die-cast from white brass. The cabinet proper comes electrically welded and rustproof, lacquer finished. Vanities for women, and sliding light mirrors are also manufactured. For women, an outlet for a curling iron may be attached. Tested.

Toasted by a Turn

TOASTED sandwiches, brown and hot, are particularly appropriate for dinner or the theatre party during winter evenings. Here's an inexpensive electric toaster that requires very little attention. The sandwiches it browns lack the soggy taste often associated with toasted sandwiches. Heat the toaster till it is moderately hot, put the sandwich on top, pressing upon it with the wooden block supplied for that purpose. Reverse with the turner in one minute. The turner is also the handle.

The Machine's the Drudge

DISHWASHING must be faced at least once a day. With this combination electric dishwasher and sink, it is no longer monotonous drudgery. The model illustrated is 43¾ inches long, from the wall to front it measures 24 inches. It can be adjusted to any desired height. There are two trays which can be removed independently to hold glassware, china and silver.

What Is It?

TO conserve space we now have electric refrigerator-buffet combinations for all rooms of the house. This one is early English in style, of antique oak. The left hand compartment has a shelf for linen and one for glasses. The right hand partition reveals a regular refrigerator and the panel beneath it is a drawer for silverware.

Names and Addresses of Manufacturers Furnished Upon Request

www.americanradiohistory.com

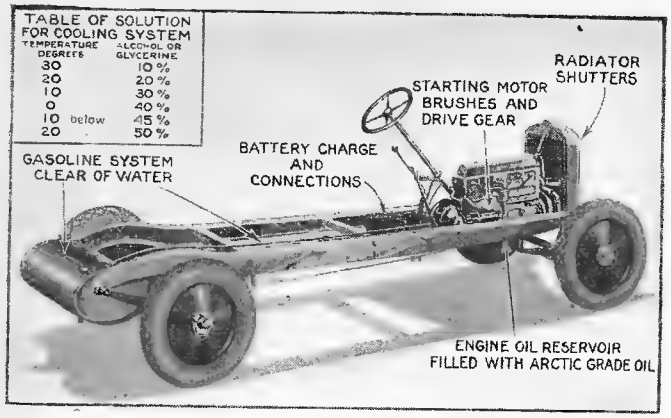


Figure 1.—For keeping your battery, engine oil, gasoline system, radiator shutters, and starter in good working order.

Overhauling the Car for Winter

By Arthur George
Consulting Engineer

This Month We Feature Suggestions on How to Keep Your Car in A-1 Condition for the Colder Months

UPON the car owner's observance of simple rules depends his lack of motor troubles during the winter. By giving attention to the items on sketch (1), he may drive with freedom and avoid the woes of the careless motorists.

Battery—More use of lights along with more short trips gives the generator less chance to keep the battery charged. Clean the battery terminals frequently, and set the generator to deliver a heavier charge. A small trickle charger in the garage helps to keep up the battery charge.

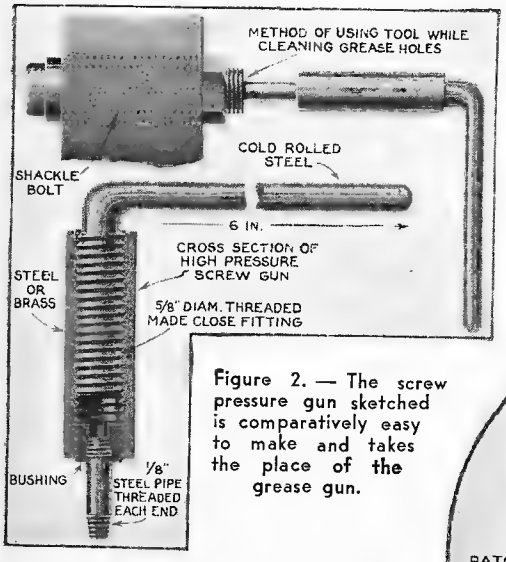

METHOD OF USING TOOL WHILE CLEANING GREASE HOLES
COLD ROLLED STEEL
SHACKLE BOLT
6 IN.
CROSS SECTION OF HIGH PRESSURE SCREW GUN
STEEL OR BRASS
5/8" DIAM. THREADED MADE CLOSE FITTING
BUSHING
1/8" STEEL PIPE THREADED EACH END

Figure 2. — The screw pressure gun sketched is comparatively easy to make and takes the place of the grease gun.

Engine Oil—You should drain the oil in the engine and fill up with the lightest grade, "Arctic". Light oil flows to all bearing surfaces without congealing and saves the battery charge by lessening the strain of starting.

Gasoline System—Water, sometimes a troublemaker in the summer, will most likely cause worse trouble in the winter by freezing around the valves of the carburetor or the vacuum tank, and making them stick. Ice formation in gasoline lines will cut off the supply of gasoline. To insure the absence of water a thorough cleaning of the fuel system by draining and flushing is necessary.

Starter—It may be well to have the starter checked over to see that the driving gear and spring are in good shape. The starter brushes, commutator and connections in the motor should be inspected and repaired wherever necessary.

Radiator—Shutters or winter fronts are desirable additions to a radiator for winter use. Adjustable shutters allow for a reduction in the amount of icy air that rushes past the radiator and engine. Enough air can be admitted to cool the radiator without bringing the temperature low enough to cause condensation of the fuel and undue oil dilution by unburned gasoline. The main precaution in the cooling system is that of preventing freezing. Alcohol, glycerine or a combination of these two are good anti-freeze liquids that can be obtained quite readily. Alcohol is cheapest, but will evaporate. Glycerine is comparatively expensive, but one filling will last all winter, barring leakage, and can be drained out in the spring and saved for the next winter filling. A lump of washing soda as large as a marble may be added. A combination of equal parts of each with the water makes a good mixture, but the alcohol will evaporate just the same. Where alcohol is used, test the solution frequently with a hydrometer; replace alcohol as indicated.

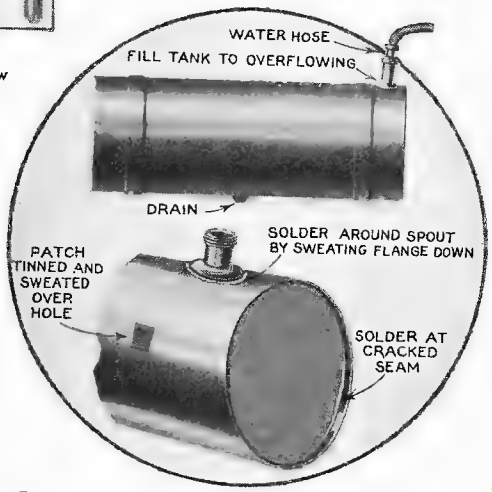

WATER HOSE
FILL TANK TO OVERFLOWING
DRAIN
SOLDER AROUND SPOUT BY SWEATING FLANGE DOWN
PATCH TINNED AND SWEATED OVER HOLE
SOLDER AT CRACKED SEAM

Figure 3.—Make your tank safe before repairing it with a torch or hot soldering bit. All repairs must be substantial jobs of soldering in order to be effective.

The table of recommended percentages given in the attached illustration shows the percentage of anti-freeze. The water required is that quantity to make up a hundred per cent. As an example, for 20 degrees use twenty parts of alcohol and eighty parts water. The total being one hundred parts.

Where the pressure grease-gun fails to oil spring shackles, the steering gear and other parts of the car are usually neglected, because of clogged grease leads. If this happens on the steering gear, the bearing

(*Continued on page 743*)

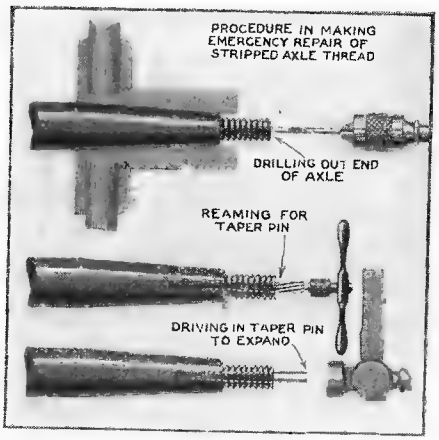

PROCEDURE IN MAKING EMERGENCY REPAIR OF STRIPPED AXLE THREAD
DRILLING OUT END OF AXLE
REAMING FOR TAPER PIN
DRIVING IN TAPER PIN TO EXPAND

Figure 4.—Repairing stripped axle thread.

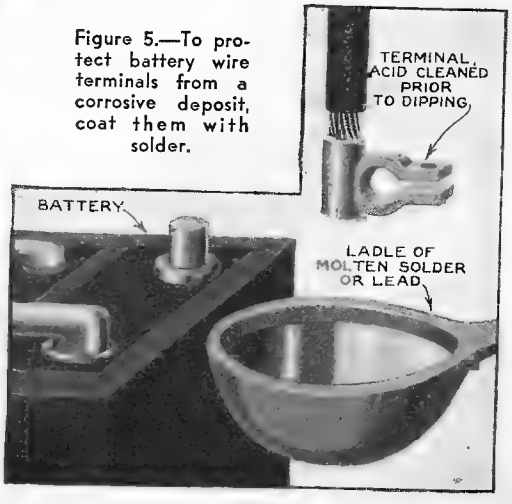


Figure 5.—To protect battery wire terminals from a corrosive deposit, coat them with solder.

www.americanradiohistory.com

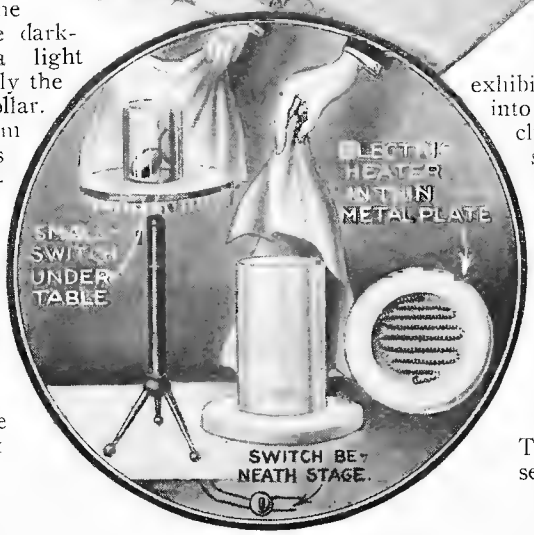
MAGIC

By Dunninger*

The master mind of modern mystery, who has mystified Ex-Presidents Harding, Taft, Roosevelt, Coolidge, the Prince of Wales and other celebrities.

The Enchanted Disc

IT has been reported that magicians of the Far East perform the effect which is here described. The dark-skinned wonder-worker exhibits a light silvered fibre disc having approximately the same diameter as an American half-dollar. This he places on a rug in front of him and after making some mystic passes over the same, the disc moves about erratically. The method employed is unusually ingenious. An examined disc is substituted for one that has been previously palmed by the conjurer. The bottom surface of this disc has a small bug glued to it. The bug in attempting to move away carries the disc with it. This is no particular burden to the bug. At the end of the performance, the coin and bug are placed in a small box containing leaves.



Vanishing Lemons

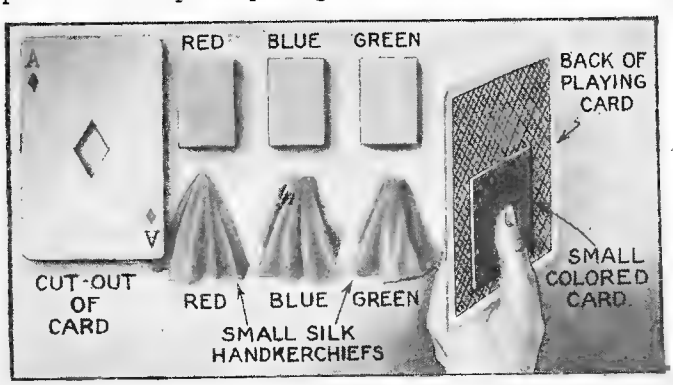
A TRANSPARENT glass chimney is resting upon a thin metal tray and standing on an undraped table is exhibited. Two or three lemons are dropped into the cylinder. A borrowed handkerchief is put over the glass tube for several moments and when the handkerchief is removed, the cylinder is found to be quite empty. The effect is accomplished by a simple electrical arrangement, which can easily be constructed by the average amateur. Two wires run up one leg of the table to a heating unit of the flat type. The lemons are hollow and composed of yellow wax. These have previously been molded in a suitable mold that one can construct. They should be thin. When current is secretly turned on, the lemons are melted.

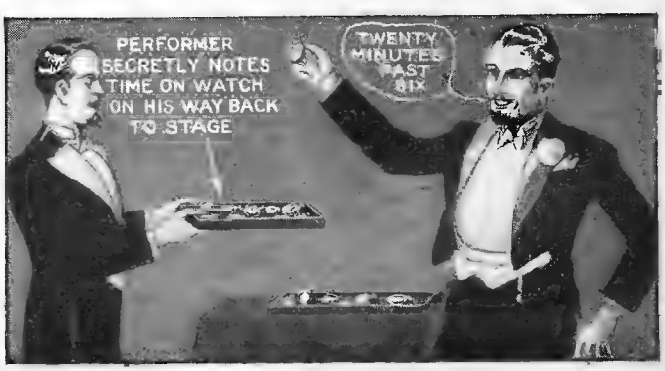
The Changeable Pip

THE magician after removing the ace of diamonds from a pack of playing cards directs the attention of the audience to six small silk handkerchiefs resting upon the table. These are colored, red, orange, yellow, green, blue and violet. One of the shades is chosen by the audience. The magician picks the silk up and passing it slowly over the face of the ace of diamonds, he changes the color of the pip to correspond with the color of the silk. This effect is repeated with the other colors. The secret lies in the fact that a small piece of cardboard, having a color corresponding to the color of the handkerchief is fastened to it. This card is detached and held behind the cut-out pip.

Timely Second Sight

THE magician, having asked several members of his audience to set their watches at different times and place them face downward on a tray, returns to the stage with a tray full of watches and promptly proceeds to read the correct time on each watch, and also calls for acknowledgement on the part of the owner (*Continued on page 762*)





*No. 87 of a series of articles on magic appearing monthly.

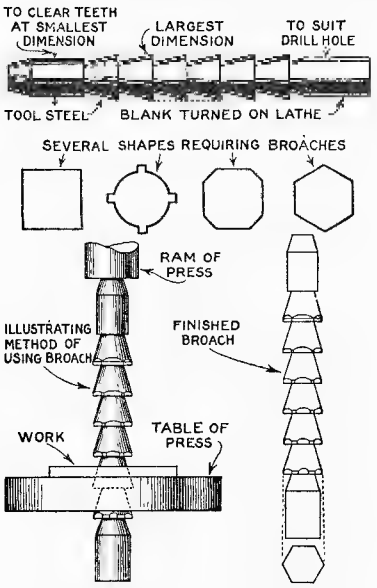
www.americanradiohistory.com

For the Home Machinist

By George A. Luers

This Monthly Page of Practical Suggestions Is for You. . . . Should Any Problems of Machine Shop Practice Arise, Send Them in to Us

Details of Making Broaches of Simple Form

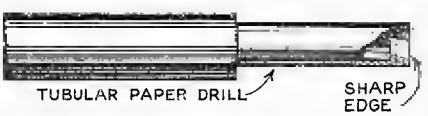


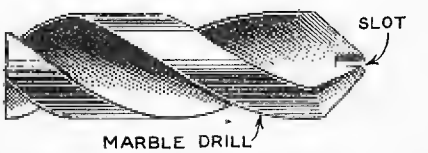
SUCH shapes as square, rectangular, oval, slotted and flat sided holes, are best made with a broach. Broaches are made in sets—small, larger and largest. For taking successive cuts out of a job with only a drilled hole to start the tool through, the broach is made from drill rod or other round steel which can be hardened. The pilot is turned down to the same diameter as the hole desired. The cutting teeth are turned as shown, while the ram end is turned enough to pass through the work. The end is tapered to allow for burrs to form. When the teeth are correctly shaped they are backed off by hand filing.

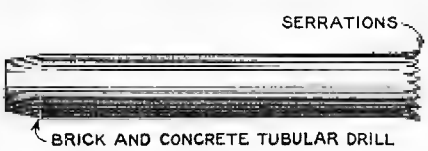
While a broach press is desirable for this work, any kind will do to push a cutter through.

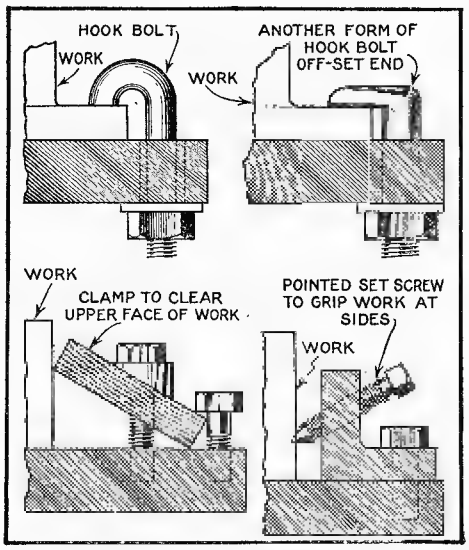
Types of Drilling

A TUBULAR drill for cutting paper or semi-hard fiber, to be run at about 2000 R. P. M., is frequently required for cutting holes one half inch or less. A twist drill with a slot in the end serves to drill marble. The drill point is preferably quenched at white heat. Slow speed and considerable pressure aid in making this drill cut. The drill to provide openings for bolts or fastenings in brick work is driven in with a hammer. It is a tubular chisel of wrought iron pipe with the hammer end plugged. The teeth must be hardened.



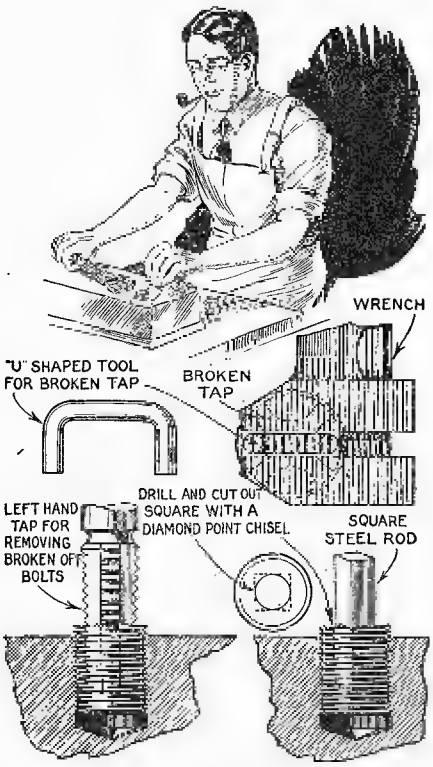






To Clamp Work

A JOB often requires clamps to accommodate the special shape of the part to be held. Ordinary hook bolts shaped from round stock will be found cheap and effective. When necessary to keep clamps entirely below the job either of the two methods in the lower views will prove serviceable. The diagonal clamp is blocked at one end and drawn down with a bolt near the center. The edge that rests against the side of the work should be fairly sharp. Pointed set screws in the blocks are easily arranged; the screws inclined so their pressure will cause the work to be pushed against the machine bed; at the same time the point is forced in.


WRENCH
"U" SHAPED TOOL FOR BROKEN TAP
BROKEN TAP
LEFT HAND TAP FOR REMOVING BROKEN OFF BOLTS
DRILL AND CUT OUT SQUARE WITH A DIAMOND POINT CHISEL
SQUARE STEEL ROD

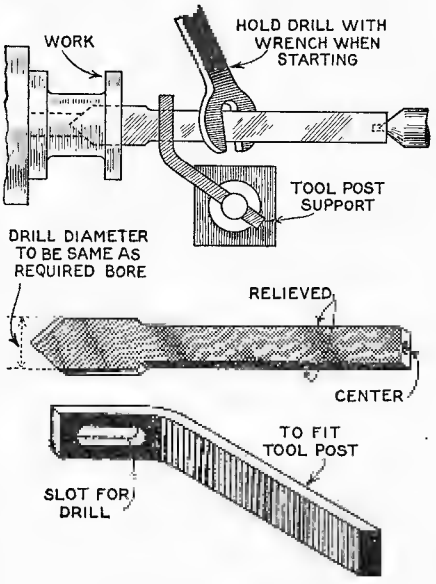
Broken Parts

WHEN the tap is broken off a simple means to remove it is to make a "U" shaped tough steel rod, drop it over the broken tap so as to enter the grooves and turn with a wrench. Where a bolt is wrenched off, drill partly into the bolt, insert a left hand tap and carefully back the bolt end out. Another method for removing the broken part is to drill a hole, using a diamond point chisel to make a square socket in the bolt, and insert a section of square bar, backing it all with a wrench.

The Flat Drill

WHERE a cast or forged part must be bored, a flat cheap tool of stock steel, which can be made to a diameter suitable for the work, is desirable. Such a tool must be without

(*Continued on page 744*)



www.americanradiohistory.com

Prize Puzzles to Polish Your Wits

By Sam Loyd

THE Puzzle King presents the tenth of a series of problems, the solving of which will show if your mathematical ability is bolstered up by logical reasoning. Prize winners of the September puzzles and solutions will be found on page 738.

TWENTY-FIVE DOLLARS IN PRIZES

A FIRST PRIZE of $10 will be awarded to the person sending correct answers to the three puzzles accompanied by the best expressed analysis of the Pedagogue Problem.

A SECOND PRIZE of $5 will be awarded for the next best analysis and correct answers to the two puzzles.

TEN PRIZES of $1 each will be awarded to the ten persons who send the next best analyses of the Pedagogue Problem together with correct answers to the two puzzles.

Answers must be received not later than noon, December 15, addressed to "Puzzle Editor," SCIENCE AND INVENTION, 381 Fourth Avenue, New York City.

All contestants must abide by the decisions of Sam Loyd, who will examine all papers and award the prizes.

Papers of identical merit, tying for any one of the prizes, will each receive the full amount of the prize tied for.

Red Man Psychology

AN old Scot, who for a third of a century has presided over an Indian trading post in the Canadian Rockies, takes exception to our preconceived notions of the Red Man.

"The average American Indian leans backwards in his scrupulous honesty," insists the old factor. "While he is childishly eager in his acceptance of gifts, when it comes down to an actual business transaction, I have found his word assays better than many a White's bond.

"I will admit, however," continued the trader, "that the Indian is the most stubborn human in the world. He insists upon doing business in his own way, and this pig-headedness frequently works out to his disadvantage. That doesn't seem to matter, so long as he succeeds in bending the other fellow to his own primitive ways.

"As an example of Indian psychology, let me tell of an experience with Chief Big Elk. When we first undertook to weigh up this man's medical supplies on the apothecaries' scales, you could hear his protesting whoop a furlong away. To him, ringing in a new kind of scales was just flagrant White humbugging.

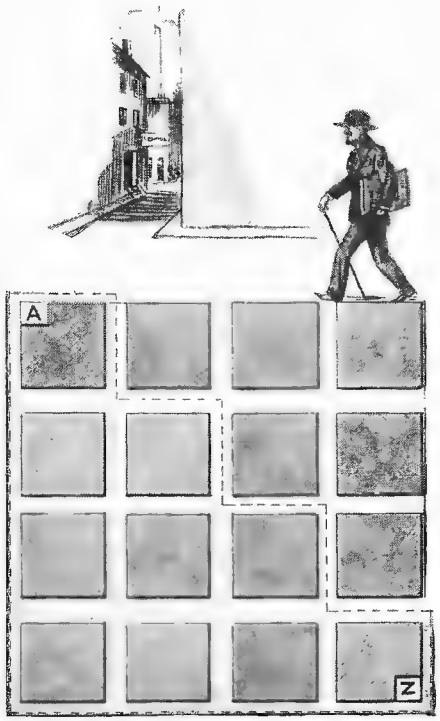
"Finally, he was induced to accept his Rochelle Salts by the troy, or apothecaries' pound. Then, one fine day he came in for a quantity of plain rock salt. When we started to weigh this out on the avoirdupois scales, the Elk went berserk with rage. Salt was salt, and by our own ruling it was troy merchandise.

"Well, there was no budging him this time; so Big Elk paid ten cents the troy pound for his rock salt, although that was the pound price avoirdupois.

"The Elk's orders were always for the same number of pounds of rock salt, and, peculiarly enough, that quantity registered a number of whole pounds when weighed avoirdupois, or when weighed troy.

"We always secretly rebated him with the overcharge, and as it amounted to less than five dollars, you will find it a neat little problem to figure out from the data I have given you, just how much rock salt the Big Elk laid in."

That's the question for our puzzlers to answer: How much rock salt was Big Elk in the habit of buying?



The Peripatetic Pedagogue

"THE daily round trip between my home and the schoolhouse keeps me in good physical trim," remarked the pedagogue.

"This is a map of our village," he explained, "and you will note that my domicile at one corner, marked A, is, through the streets, eight blocks distant from the diagonally opposite corner, marked Z, on which is located the schoolhouse.

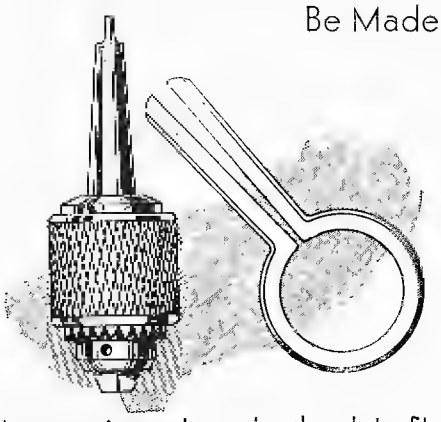
"So, you see, my diurnal excursion is sixteen blocks long, and I break the monotony of the walk by changing the route in some respect each day. You will be surprised, when you come to figure it out, how long I can keep up that program of a daily variation in my stroll without repeating."

Let us clearly understand the professor. If the dotted line illustrates his first excursion, then how many more sixteen-block-long round trips can he make between his home and the schoolhouse before it becomes necessary to retrace precisely that original route? Any variation in the course constitutes a new route, but all must be sixteen blocks in length, disregarding the street widths.

www.americanradiohistory.com

Try These in Your Own Workshop

Here Are Six Suggestions of Our Own Contributors That Have Proved Practical . . . and All These Devices Can Be Made at Home



A square iron rod can be shaped to fit around the knurled sleeve of a chuck, so that when the hold or teeth become worn, this grip will serve satisfactory.

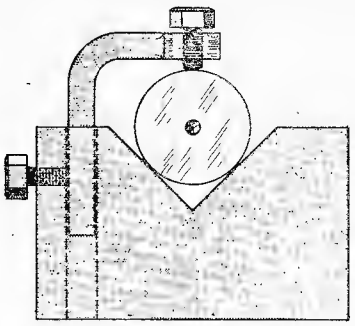
When the Chuck Becomes Worn

A DRILL press is one of the most popular tools for the workshop. Because of the resulting wear and tear, it is sometimes impossible to tighten the chuck with a key provided for this purpose. A simple device can be made of a one-half inch square iron rod which can be bent on an anvil or shaped by other suitable means, as shown in the accompanying sketch. The hand of the grip can be rounded off so that you can hold it comfortably.

—*Robert Shugro.*

A Handier "V" Block

TO facilitate handling jobs we quite often fasten the work to a "V" block. Here is an easy way to do the trick. The sketch shows how an "L" shaped piece of square steel rod is held



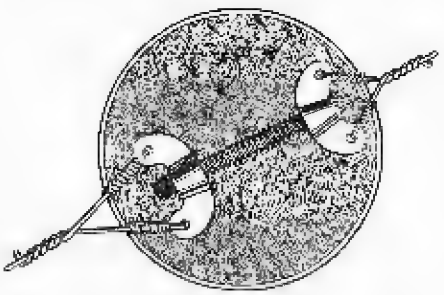
This easy method of attaching a clamp to a "V" block will save many a bruised finger.

in the block at one end. The other end is drilled and tapped for the insertion of a screw which can be adjusted to grip the job. This will help getting the drill started and keeping the bit intact.

—*Arthur Howarth.*

A Satisfactory Turnbuckle

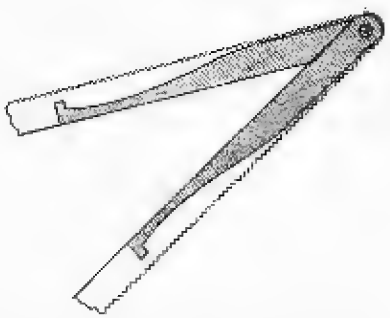
TWO oversized butterfly nuts or wing nuts and a bolt will make a serviceable turnbuckle. Holes can be drilled in the wing nuts and the wires which are to be fastened to the improvised turnbuckle drawn through these holes. Or, if it is impractical to drill holes in the wing nuts the wires may merely be wound about the ears without impairing the efficiency of the device.—*Raymond B. Wailes.*



In making this turnbuckle wires can either be fastened to the wing nuts or wound on the ears. The bolt is turned with pliers.

Emergency Calipers

THE experimenter may find use for a pair of calipers in his home workshop. If he is not a frequent user of them, an inexpensive yet practical instrument can be made at home from an



Just break an old hacksaw blade in the middle, rivet the two ends together and grind to shape for these calipers.

old hacksaw blade. Just break the blade at its midpoint and rivet the broken ends together so that the two arms can be open or closed with comparative ease. Grind the blades to the shape indicated in the sketch, and your calipers are complete.—*R. S. D.*

Have you entered our model tool contest? Why not get your share of $3,250.00 in equipment for your home workshop. See page 694.

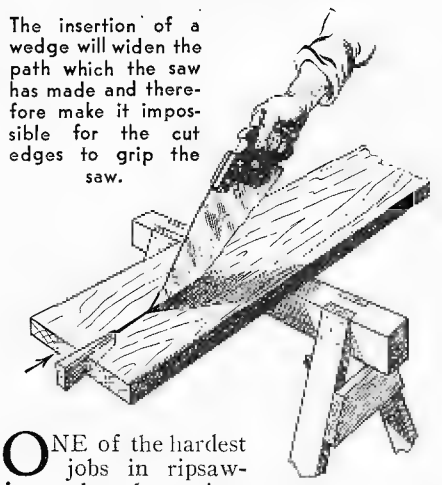
A flattened cotter pin inserted in copper or steel tubing will provide a handle for use in driving in screws where they would normally be inaccessible.

Screw Holder from Cotter Pin

AN efficient tool for inserting screws in places inaccessible to the fingers or a screw-driver can be made by flattening a cotter pin in a vise. The pin is mounted in a suitable holder, made to fit any length or diameter desired. This makes an especially good tool for light work—such as carburetors, clocks, watches and small motors. Of course the converted cotter pin does not attempt to take the place of the screw-driver. It is to be used only for picking up the screw and inserting it into the material until they gain a hold. Then an ordinary screw-driver can be used to drive them in.—*R. H. Atkins.*

Less Elbow Grease

The insertion of a wedge will widen the path which the saw has made and therefore make it impossible for the cut edges to grip the saw.



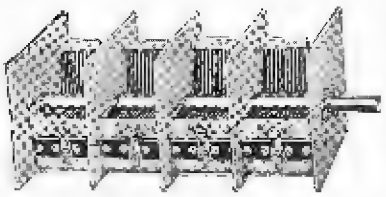
ONE of the hardest jobs in ripsawing a board, particularly when the wood is not very strong, is to make a clean cut without binding the saw. If you insert a small wooden wedge between the severed edges of the board you can proceed with very little difficulty. The wedge will spread the board so the saw will slide very easily, back and forth with a minimum friction.—*R. W.*

www.americanradiohistory.com

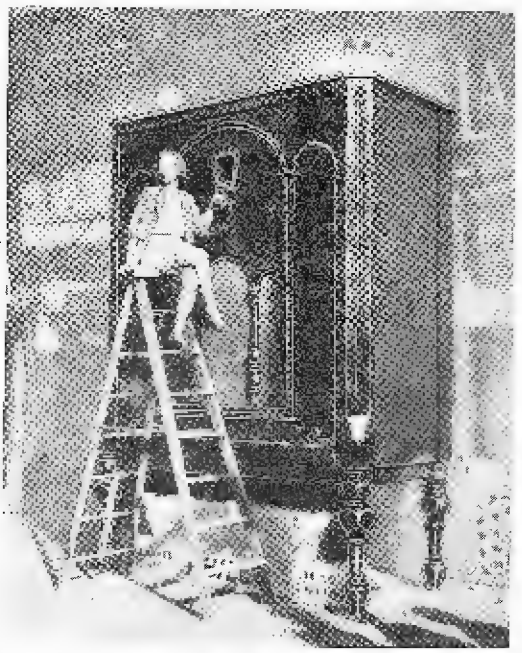
What's New in Radio

Some 1931 Ideas from the Seventh Annual Radio World's Fair

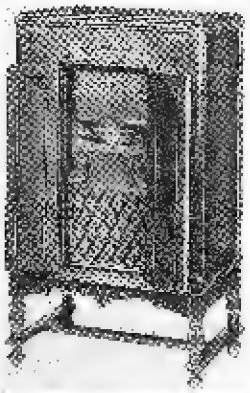
THIS year's Radio World's Fair, more than any other, demonstrated beyond question that the modern radio set has become as much of a household necessity as the very furnishings. That the industry itself is mature and stable was evidenced by the general perfection of design and finish, both external and internal. New features were, with one possible exception, sound and conservative. There were no sensational stunt departures from generally accepted practice such as have, in years gone by, been offered to the public regardless of their real efficiency so long as they appeared to present a sufficiently plausible reason for attracting the not-so-technically-minded buying public.

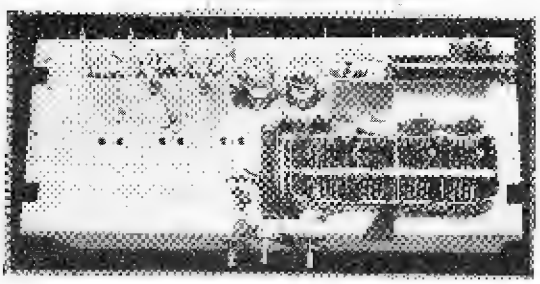


Left—New Hammarlund gang midline condenser. Right—Miss Jeanne Dore up on a ladder tuning in on the world's largest radio receiving set. The set has 22 tubes and gives very clear reproduction.



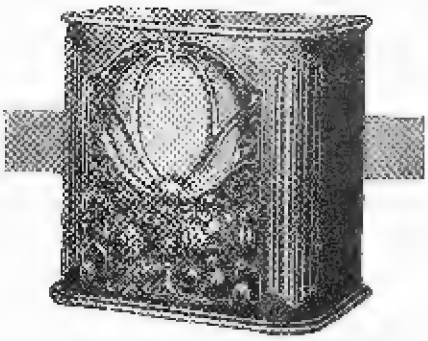
The possible exception is the new feature, widely adopted this year, called the automatic volume control. Arguments in favor of this device are that the volume level remains the same at all times, unless manually adjusted, thus preventing overloading of the speaker on local stations, and fading when distant stations are being received. This feature, although new in broadcast receivers, has been in use for some years in commercial point-to-point short wave telegraph receivers, where it functions admirably. But in broadcast reception, we do not want a receiver which will automatically level out all signals to the same degree of intensity. Perfect reproduction involves not only perfection of tone. It involves also the perfect reproduction of light and shade in music. In other words, the original balance between the pianissimo and fortissimo passages of a musical rendering must be preserved, else the "colour" of the performance is entirely lost. Controversy raged around this point some time ago when it was the practice of the control room engineers at the broadcasting stations to reduce the volume of fortissimo passages and increase that of pianissimo passages. Having now got the transmitting end right, there is no sense in ironing out the volume level at the receiver.





Pictured above is the new R.C.A.-Victor Radio-Electrola with home recording. The cabinet is walnut-veneered, 46 inches high, 27½ inches wide, and 18¼ inches deep. An interior view of the chassis is also shown.

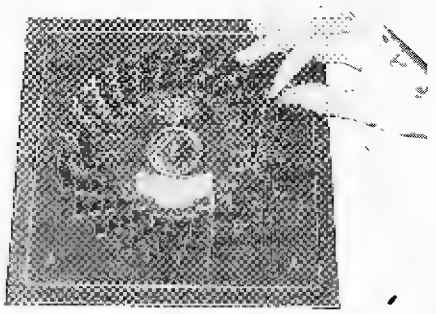
One of the midget sets, the Crosley Buddy, is a self-contained A.C. electric radio receiving set only 15 inches high, 15⅜ inches wide and 9¼ inches deep. It has two screen-grid type -24 tubes in the R.F. stages, one screen-grid type -24 in the detector stage, one type -45 tube in the power output stage, and one type -80 tube as a rectifier.



Other features of this year's sets were straight line tuning scales with automatic lighting when the desired station is reached, one knob tuning, noise filters, phonograph connections, local-distance switch, humless operation, two-element detector tubes, preselector tuning, the increased use of shielding, which in some cases amounted almost to armouring, "whisper tuning," and tone control.

With automatic dial lighting, as the tuning control is moved over the scale, a light flashes up as soon as the adjustment for the desired station is reached, and in some cases the name of the station appears also. Pre-selector tuning enables the achievement of razor sharp tuning while at the same time admitting the full ten-kilocycle band width. By means of the local-distance switch the resonance curve of the receiver is widened when receiving from the local station, and narrowed for distance reception, so that cross-talk or side-band fringe interference from the local is eliminated. The whisper tuning feature reduces volume level to a whisper while tuning is being effected, thus preventing unwanted stations from blaring forth. By means of the new tone control, the listener can accentuate either the bass or the treble, according to his tastes, or in accordance with the particular acoustics of his home. An admirable feature, which should put an end to much acrimonious discussion anent the tonal quality of a particular set's reproduction.

So much progress has been made in the elimination of A.C. hum that this year's radio sets can be operated at low volume levels without that disagreeable background hum becoming apparent, as has been the case in the models of past years. The addition of noise filters also eliminates (*Continued on page* 759)



A close-up of the new Lyric automatic 24-hour self-tuner, which fits under the top lid of the receiver in an easily accessible position.

www.americanradiohistory.com

A Motor Driven Sea Sled

By F. B. Charrelear

The Author Built This Sled Himself for Less Than $15. You Can Easily Do the Same, and Have Lots of Fun With It Next Summer. The Motor and Tripod Can be Put on a Sled or Ice-Boat for Winter Use.

The author photographed on his sea sled, made in accordance with the instructions given in this article.

THE Sea Sled as illustrated, was built by the writer with an expenditure of between ten and fifteen dollars and is capable of attaining a speed of from ten to fifteen miles an hour.

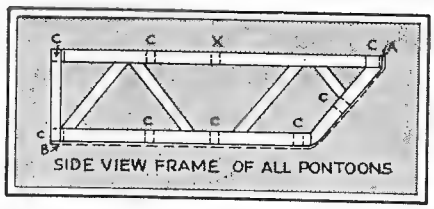
The pontoons are built entirely from three-ply veneer obtained from one piano box and the framework is built from the batterns or bracing pieces of the same box.

The frame proper, which supports the pontoons and also the motor tripod is built from 1½"×2" white pine held together by wood screws and angle irons.

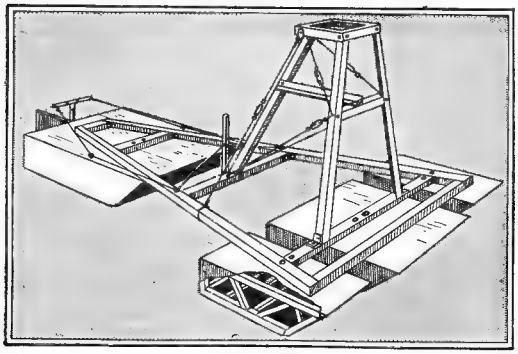
The propeller was built from clear white pine, evenly balanced and drilled to fit the motor shaft.

The motor is of ¾ horse power, air cooled, manufactured by the Maytag Washing Machine Company for use on their machines.

Following is a detailed explanation of the construction of the sea sled. By following the accompanying illustrations, anyone with a little mechanical ability will be able to construct this boat in a few hours and at very little expense. The motor frame and motor may easily be removed and placed on skis during the winter months and used either on snow or ice.

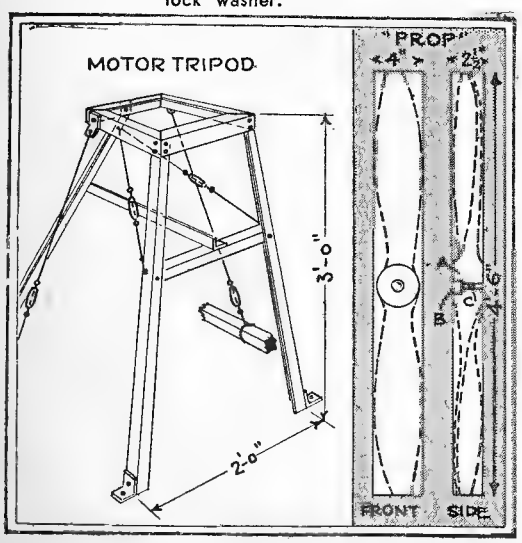


Rear pontoon, 3' x 3' x 8" over all. Front center pontoon, 3' x 2' x 8" over all. Front pontoon 2' x 1'4" x 8" over all. Assemble frame. Bend one piece of veneer from A to B. Secure with brass screws. C—cross members. X—members, drilled for bolts.



General perspective view of the completed sled, without the motor and propeller.

Secure all joints and fasten to frame with angle irons. Brace with wire clothes line and turnbuckles. Propeller details: A—Fibre gear. B—Brass bushing. C—Nut and lock washer.



Motor and Propeller

In the flywheel of the motor is a governor which cuts out when the motor attains a speed of over 1150 R.P.M. The spring holding this governor should be removed and a short piece of iron wire inserted in its place. This will cause the motor to fire on every revolution of the flywheel and thereby increase the speed to about 1500 R.P.M.

The small air lines in the gasoline mixer may also be reamed out larger with a small steel drill slightly larger than the present holes to obtain greater speed, but this is not necessary as there is but a slight difference after this operation. Next place a small switch on the wires leading from the magneto, located in the fly-wheel.

As illustrated in the drawing of the propeller, the end of the crankshaft which projects past the flywheel is step-cut. As this differs somewhat in different motors it will be necessary for the builder to measure the shaft of his motor to get the exact dimensions. For the larger step, next to the flywheel, a brass bushing may be purchased at any machine shop to fit. For the second step which is fitted with a lock-key, the fiber gear with which the machine is equipped may be used by cutting off all of the teeth, except three spaced at regular intervals. These teeth fit into grooves cut in the drilled hole in the propeller. Next measure the exact outside dimension of the fiber gear with the teeth removed and the outside of the brass bushing, and drill the center of the propeller accordingly. This will leave room past the end of the gear for the nut and lock washer which hold the propeller on the shaft.

The propeller is carved from a block of clear white pine 4"×2½"×4' 6" with a sharp drawing knife and sanded down to a smooth finish. Care should be taken to dish out the inside of the blades and round off the outside.

The ends should be tipped with a linen bag cut and sewed to a tight fit as shown in the illustration, after which several coats of shellac should be given, followed by two coats of a good spar varnish. A hexagon-shaped wood plate may also be cut to cover the shaft hole in the propeller; it is fastened in place with small wood screws. Now drive the brass bushing into place in the shaft hole of the propeller and also the fiber gear. It is well to shellac both before inserting, as this will strengthen the job. Next mount the propeller and the motor is ready for use. I might also mention that a second-hand motor of this type may be purchased for around five dollars.

No explanation is necessary for the frame itself, as the illustration is self-explanatory.

Now build the framework for the pontoons as illustrated and cover them with the veneer taken from the sides of the piano (*Continued on page 737*)

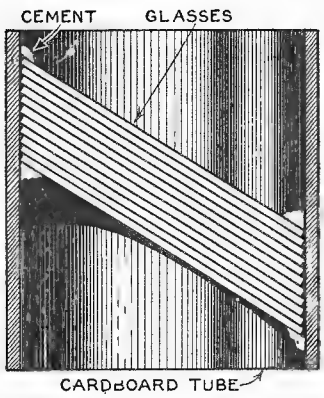
www.americanradiohistory.com

The Oracle

Inexpensive But Efficient Nicols Prism

(2370) Mr. Adolph Gottforeht, Staten Island, N. Y., writes:

Q. 1. I have a good Spencer microscope and wish to equip the instrument so that I will be able to examine polarized light for the study of minerals, rocks, etc. I know that there are Nicols prisms on the market for the purpose, but they are rather expensive. Could you suggest an inexpensive means of producing polarized light?



A. 1. Experiments have indicated that quite a satisfactory polarizer can be made up of microscope cover glasses.

The microscope cover glasses are generally clamped together so as to form a thickness of from three eighths to one half inch. The glasses are then set at an angle of about forty-five degrees, two complete such units being made to produce the polarized effect. Each set of cover glasses is therefore mounted in a cardboard container and after adjustments have been properly made, and if you find the method satisfactory, it is advisable to seal the cover glasses in place by means of paraffin, or sealing wax.

Cover glasses are not nearly as expensive as are the Nicols' prisms. We would suggest that you try out the effect.

Mind Reading?

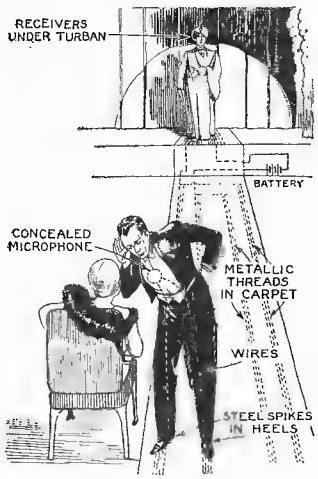
(2372) Mr. A. W. Chambers, Dallas, Texas, writes:

Q. 1. About four years ago you published under the secrets of Doctor Hargraves, an exposé of a radio set built into the clothing of the performer to be used in a mind reading act. Could you furnish me with the circuit and a list of the parts necessary for the construction of the instrument?

A. 1. The mind reading test which you wish us to describe to you is not a radio. The apparatus consists of a wired carpet, a microphone, a receiver, and a current supply, which may come from batteries. The wired carpet is an ordinary carpet into which metallic threads have been woven in two tracks throughout its entire length, so that these tracks are in reality two conductors, insulated from each other by the carpet material.

The operator in the audience wears a very sensitive microphone. The two leads to the microphone are connected to heel plates in the operator's shoes. These heel plates are steel spikes, which make contact with the metallic threads in the track—one foot, naturally, being placed on each track. The wired carpet is then connected in series with a current supply and a sensitive receiver.

The aide on the stage has this receiver concealed somewhere about his person and so can hear everything said to the operator in the audience.

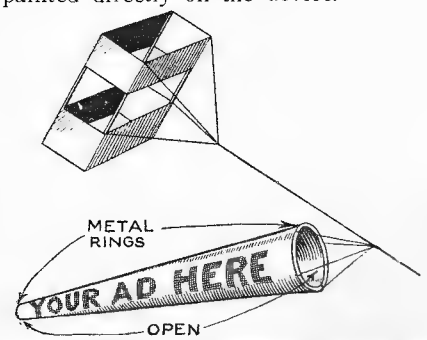


Aeronautical Advertising

(2374) Dr. Roy M. Dafforn, Kansas City, Mo., writes:

Q. 1. Can you give me some information on aerial advertising? I intend to use a kite for display purposes. Will you please show me how to make a streamer which I can attach to the kite so that it will extend horizontally?

A. 1. For your use we suggest a wind cone such as is used for target practice. Two metal hoops are used, one smaller than the other. These rings are sewn into the opposite ends of a cloth cone. The widest end of the cone is fastened top and bottom to the kite string. The advertising matter is painted directly on the device.

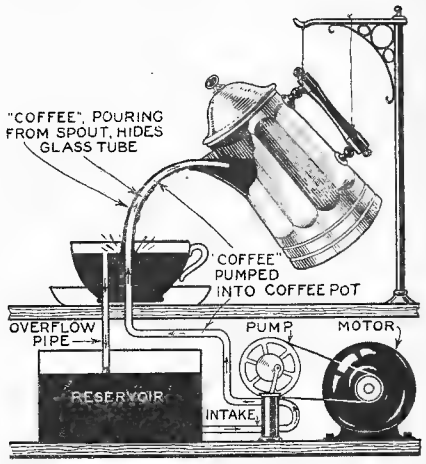


The Oracle is devoted to questions of general interest to our readers. Direct mail answers will be given at the rate of fifty cents per question.

The Inexhaustible Coffee Pot

(2373) Mr. Samuel Goldin, Laurelton, L. I., writes:

Q. 1. Not long ago I saw an apparatus in a restaurant window which consisted of a coffee pot from which coffee poured in a continuous stream automatically into a cup. The cup never overflowed. Can you tell me how this effect was produced?



A. 1. The ever flowing coffee pot consists of the following apparatus:

The cup into which the "coffee" falls has an overflow pipe which allows the fluid to drain off into a reservoir which is concealed in the table. From this reservoir the liquid is pumped by an electrically driven pump through a glass tube which rises through the cup to the spout of the coffee pot.

When the apparatus is set in motion, the dark fluid flows from the spout of the coffee pot into the cup and hides the glass tube completely. As the cup fills up the surplus fluid runs off into the reservoir through the overflow pipe. From the reservoir it is again pumped back to the spout of the coffee pot, and the cycle is completed.

Porous Cement for Iceless Refrigerators

(2371) Mr. H. H. Small, Warren, Arizona, writes:

Q. 1. Please publish the formula for porous concrete cement such as is used in the construction of an iceless refrigerator and explain just how it works.

A. 1. The formula to be used for making porous concrete cement suitable for use in the iceless refrigerator is as follows:

Cement—one part
Screened Aggregate—four parts

The above parts are to be taken by volume. The cement and aggregate are thoroughly mixed together while dry. Then enough water is added to give the mixture a consistency suitable for molding. Please bear in mind that although water-proof concrete is easily made, porous concrete must be very carefully prepared. It will utterly fail its purpose if the resulting product is partly porous and partly impervious.

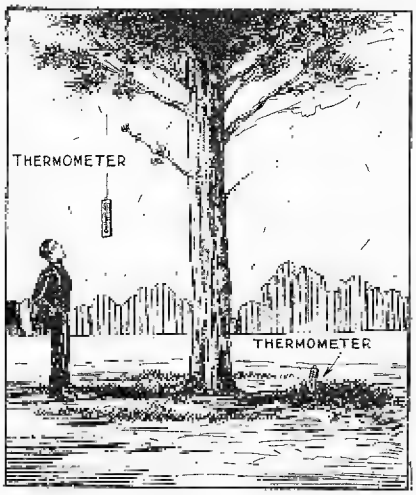
(*Continued on page* 762)

www.americanradiohistory.com

Scientific Problems and Puzzles

By Ernest K. Chapin

An Extended Field of Science Is Covered by These Questions

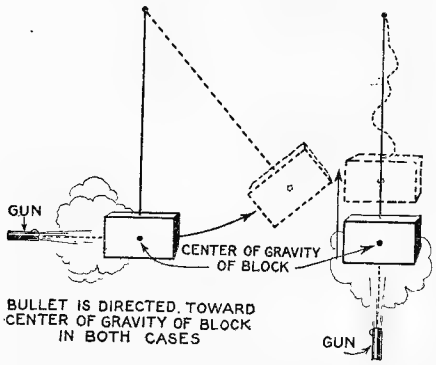


Pine Needles

USUALLY all objects tend to attain practically the same temperature level as the surrounding air. Will the pine needles be hotter, at the same temperature, or colder than the atmosphere about them?

Which Will Rise Higher?

THE speed of a bullet may be measured by firing the bullet into a block of wood suspended by a cord as a pendulum. The vertical rise of the block is then used in computing the speed of the bullet. Will the block rise



just as high if the bullet strikes it from below as it would if it were hit from the side? Assume the speed of the bullet to be the same in both cases.

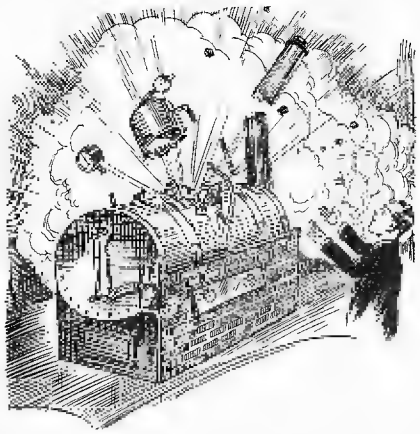
Does Everything Come Down That Goes Up?

ACCORDING to ancient theory and present-day logic everything that goes up must come down. However, meteorologists who are always trying to be different, claim that more of our atmosphere goes up than comes down. Can you justify this statement?

Solutions to These Puzzles and Problems Will Be Found on Page 744

Steam or Water?

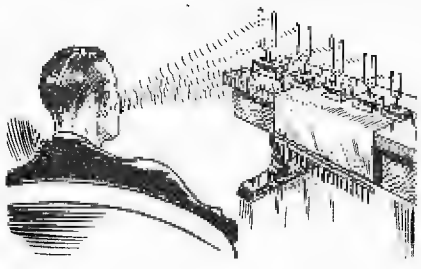
A TANK full of high pressure steam boils merrily away until all of the water has been vaporized. At this instant it explodes. Will any of the liberated steam condense and form drops of water?



Are There Tides on Dry Land?

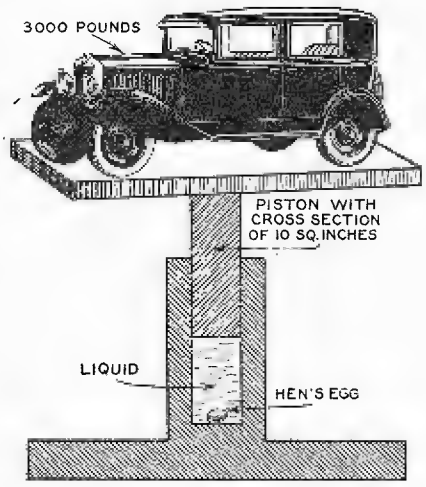
TWICE daily the level of the waters surrounding our globe is influenced in its changes by the action of heavenly

bodies. Can this same statement be applied to the more solid portions of our world? Does New York City rise and fall with a tide of its own?



How Sensitive Is Your Ear?

FIVE pure notes of the following frequencies: 200, 300, 400, 500, and 600 vibrations are supposed to be generated electrically. These vibrations are delivered simultaneously to the ear by means of a receiver. What interpretation will the ear give to this combination? In other words, what will seem to be the fundamental frequency resulting from the impression of these five notes, one upon the other?

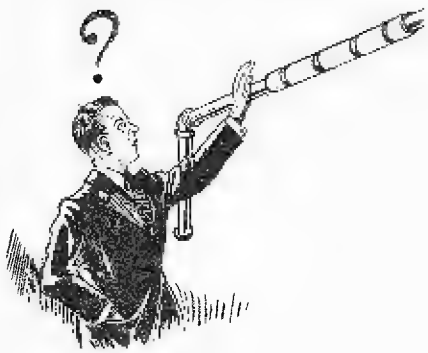


Can an Egg Do This?

AN ordinary hen's egg is encased in a delicate shell which many of us can sorrowfully say is all too fragile. If placed in the position as indicated in our diagram, will the egg be able to support a 3,000 pound car?

Insulation

DOES the use of a single layer of asbestos paper wrapped about a hot-air pipe provide effective insulation and help to prevent the heat from escaping?



www.americanradiohistory.com

Pick the Job You Want and Fill It...in a Few Months!

By means of an actually proven kind of home study training sponsored by the Radio Corporation of America, hundreds of ambitious fellows are today enjoying financial independence in work that is thrilling.

Radio needs you. Opportunities are begging for men. Good money . . . fascinating work . . . adventure galore! Read all about this tremendous modern industry . . . send for this magnificent free book. Mail the coupon now!

THE ONLY COURSE IN RADIO SPONSORED BY R.C.A.

Prepare at Home

Only an hour or so a day is all you need. This Big League training prepares you for success in all phases of radio . . . manufacturing, servicing, selling, ship and shore broadcasting, photo-radiograms, radio equipment. Our graduates are now in demand everywhere . . . because they are posted right up to the minute in everything in radio. Radio's progress each year is measured by the accomplishment of the great engineers at work in the research laboratories of the Radio Corporation of America. This world-wide organization sets the standard for the industry . . . and stands back of every lesson in the course! A signed agreement by the president of the school assures you absolute satisfaction upon completion of the training—or your money will be promptly refunded.

RCA INSTITUTES, INC.
(A division of Radio Corporation of America)

RCA INSTITUTES, Inc.
Dept. Exp.-12
75 Varick St., New York, N. Y.

Gentlemen: Please send me your big FREE 40-page book which tells about the brilliant opportunities in Radio and about your famous laboratory-method of guaranteed radio instruction at home.

Name _____

Address _____

www.americanradiohistory.com

PATENTS SECURED
TRADE-MARKS REGISTERED

High-class professional services for Inventors and Trademark users are necessary for **Proper Protection.** We offer you our facilities on reasonable terms. If you have an invention send us a model or sketch and description and we will give you our **Opinion** whether your invention comes within the provisions of the Patent Laws. Our book **"HOW TO GET YOUR PATENT"** and Record of Invention Certificate sent on request. *Delays* are *Dangerous* in *Patent Matters.* We Assist our Clients to Sell Their Patents. TERMS REASONABLE. BEST REFERENCES.

RANDOLPH & CO.
PATENT ATTORNEYS
Dept. 172, Washington, D. C.

Name .....
Street .....
City .....

INVENTORS MODELS
Mechanical specialists for over 20 years. Rendering Complete Service to the man with an Idea.
Labor-Saving Machinery Designed & Built
Circular - References - Guarantee - Free
BERNARD & HELLER 31 East 17th St. N.Y.C.

PATENTS As one of the oldest patent firms in America, we give inventors, at lowest consistent charge, a service noted for results, evidenced by many well-known Patents of extraordinary value. Book, "Patent-Sense," free. LACEY & LACEY, 635 F St., N. W., Dept. 15, Washington, D. C. Estab. 1869.

NEW YEAR - NEW IDEA
PATENT YOUR IDEAS
Call or send me a sketch of **your invention.** Phone LONgacre 3088
FREE { Inventors' Recording Blank / Confidential Advice
U. S. and Foreign Patents secured by
Z.H.POLACHEK Reg. Patent Attorney / Consult. Engineer
1234 Broadway, New York

INVENTIONS PROMOTED
Patented or Unpatented. In business over 30 years. Send drawing and descriptions or model, or write for information. Complete facilities. References.
ADAM FISHER MFG. CO., 205-D, Enright, St. Louis, Mo.

UNPATENTED IDEAS CAN BE SOLD
I tell you how and help you make the sale. Free particulars. (Copyrighted)
Write W. T. Greene
926 Barrister Bldg., Washington, D. C.

PATENT ADVICE

CONDUCTED BY JOSEPH H. KRAUS

In this Department we publish such matter as is of interest to inventors and particularly to those who are in doubt as to certain patent phases. Regular inquiries addressed to "Patent Advice" cannot be answered by mail free of charge. Such inquiries are published here for the benefit of all readers. If the idea is thought to be of importance, we make it a rule not to divulge all details, in order to protect the inventor as far as it is possible to do so.

Should advice be desired by mail, a nominal charge of $1.00 is made for each question. Sketches and descriptions must be clear and explicit. Only one side of sheet should be written on.

NOTE:—Before mailing your letter to this department, see to it that your name and address are upon the letter and envelope as well. Many letters are returned to us because either the name of the inquirer or his address is incorrectly given.

Automatic Grease Cup

(1242) Mr. Larkin Shoptaw, Kansas City, Mo., asks whether we would suggest applying for a patent on an automatic grease cup which feeds the grease out evenly.

A. Several patents have been taken out on grease cups which feed the grease out evenly. Most of these are in the form of a cup fitted with a piston arrangement, pressure being supplied by a spring on top of the piston. Grease is also delivered to the cup by any of the high pressure systems now in vogue.

It would be difficult for us to advise either against or in favor of a patent application unless we receive further details concerning the construction of your device. If it is superior to existing methods and if a broad and basic patent can be obtained and, further, if you are in a position to commercialize, or have it commercialized, we would by all means suggest further procedure.

Perpetual Motion From Springs

(1243) John Nelson, of Norman, Oklahoma, has designed a machine that is supposed to furnish its own power to continue its operation. A clock-spring turns the shaft, which shaft communicates the power back to the clock-spring through gears. Employing a ratio of 2 to 1, he expects that the clock-spring will always be fully wound and that the shaft will deliver power.

A. Your method is inoperative, and therefore non-patentable.

You should measure the power given off by the clock-spring in horsepower hours. The requisites for such a measurement are that a certain weight is lifted through a known distance at a certain definite speed. Let us assume that your clock-spring develops one horse-power. This means that it was able to raise a weight of 33,000 pounds a distance of one foot in one minute. Regardless of whether you gear this clock-spring up or gear it down, the results are the same, disregarding the losses in gearing. You can either increase the weight that can be lifted and decrease the distance through which it is lifted in the same interval of time, or decrease the weight lifted and increase the distance in the same length of time, but the amount of horse-power developed is always the same. The instant you apply the gears, belts, or other forms of energy transmissions, you introduce losses due to friction.

Window Burglar Alarm

(1244) C. W. Nauck, Birmingham, Alabama, submits a model of a burglar-alarm so arranged that it fastens to the beading on the right side of the window facing, with its lower edge even with the top edge of the lower sash. It fires five paper caps when the sash is raised. One cap is fired for each inch that the window is raised.

A. Many individuals have patented burglar alarms which set off caps or cartridges when windows are opened. Some of these devices have been placed on the market but have not made a popular appeal. Windows equipped with such protective systems require that the alarm be set on each individual window after the window is closed. The human element thus enters into the program and therefore there is some possibility that some of the windows will not be protected because of forgetfulness on the part of the person in charge.

It is a relatively simple matter for a burglar to cut a hole in the glass, turn off the alarm producing device and enter the residence.

Unfortunately, your system cannot be made as an easy attachment for windows. The difficulty in installation is a great objection to its popularity. Incidentally, the device cannot be broadly or basicly patented. We would advise against further procedure.

Can Opener

(1245) Carlton C. Mills, New York City, N. Y., has produced a new type of side-cutting can opener, which consists of a slideable center-point, a side-cutting wheel and a lever arrangement to hold the side-cutting wheel against the sides of the can.

A. Your system is hopelessly im practical. In order to make your device operate properly it is absolutely essential that the exact center of the can be punched by the pointed sliding member. There is not enough play in the side-cutting wheel to allow for variations from the center that the average individual is bound to make. Furthermore, your system presents entirely too many adjustments for relatively simple operation. There are can openers today that do the same work that your device would do, and perform it in a better fashion. Present-day constructions are much simpler, they do not require as many operations as this assembly, nor are they as likely to get out of order.

We certainly would not suggest further procedure.

www.americanradiohistory.com

PATENTS

At the right is a view of my drafting and specification offices where a large staff of experienced experts are in my constant employ.

All drawings and specifications are prepared in my offices.

My Offices Just Across Street From U. S. Pat. Office

Protect Your Ideas

Take the First Step Today—Action Counts

If you have a useful, practical, novel idea for any new article or for an improvement on an old one, you should communicate with a competent Registered Patent Attorney AT ONCE. Every year thousands of applications for patents are filed in the U. S. Patent Office. Frequently two or more applications are made for the same or substantially the same idea (even though the inventors may live in different sections of the country and be entirely unknown to one another). In such a case, the burden of proof rests upon the last application filed. Delays of even a few days in filing the application sometimes mean the loss of a patent. So lose no time. Get in touch with me at once by mailing the coupon below.

Prompt, Careful, Efficient Service

This large, experienced organization devotes its entire time and attention to patent and trademark cases. Our offices are directly across the street from the U. S. Patent Office. We understand the technicalities of patent law. We know the rules and requirements of the Patent Office. We can proceed in the quickest, safest and best ways in preparing an application for a patent covering your idea. Our success has been built on the strength of careful, efficient, satisfactory service to inventors and trade-mark owners located in every state in the Union.

Strict Secrecy Preserved—Write Me in Confidence

All communications, sketches, drawings, etc., are held in strictest confidence in strong, steel, fireproof files, which are accessible only to authorized members of my staff. Feel free to write me fully and frankly. It is probable that I can help you. Highest references. But FIRST—clip the coupon and get my free book. Do THAT right now.

No Charge for Information On How to Proceed

The booklet shown here contains valuable information relating to patent procedure that every inventor should have. And with it I will send you my "Record of Invention" form, on which you can sketch your idea and establish its date before a witness. Such evidence may later prove valuable to you. Simply mail the coupon and I will send you the booklet, and the "Record of Invention" form, together with detailed information on how to proceed and the costs involved. Do this NOW. No need to lose a minute's time. The coupon will bring you complete information entirely without charge or obligation.

Clarence A. O'Brien

Registered Patent Attorney

Member of Bar of: Supreme Court of the United States; Court of Appeals, District of Columbia; Supreme Court, District of Columbia; United States Court of Claims.

PRACTICE CONFINED EXCLUSIVELY TO PATENTS, TRADEMARKS AND COPYRIGHTS

Inventors *Write for these* Free Books

Mail this Coupon Now

CLARENCE A. O'BRIEN

Registered Patent Attorney

53B Security Savings & Commercial Bank Bldg., Washington, D. C.

—or—

Suite 1106, Dept. D-6, Woolworth Bldg. New York City

Please send me your free book, "How to Obtain a Patent," and your "Record of Invention" form without any cost or obligation on my part.

Name.....

Address.....

.....

(Important! Write or print plainly, and address office nearest you)

www.americanradiohistory.com

INVENTORS FINANCE CORPORATION

Will assist you to obtain protection when, due to the lack of funds, you cannot file application for patent without long and dangerous delays.

UNION TRUST BUILDING
WASHINGTON, D. C.

Chicago representative—N. E. HEWITT
Room 1853, 111 West Washington Street

Write us immediately for free information regarding our time payment plan for the benefit of inventors.

———MAIL THIS COUPON NOW———

INVENTORS FINANCE CORPORATION
Dept. C, Union Trust Bldg., Washington, D. C.

Please send me particulars with reference to above plan, and information about the way to proceed.

Name .....

Address .....

City ..... State .....

PATENTS

BOOKLET FREE HIGHEST REFERENCES
PROMPTNESS ASSURED BEST RESULTS

Send drawing or model.

WATSON E. COLEMAN, Patent Lawyer
724 9th Street, N. W., Washington, D. C.

PATENTS—TRADE MARKS

All cases submitted given personal attention by a member of the firm.

Information and booklet free

LANCASTER, ALLWINE & ROMMEL
255 Ouray Bldg., Washington, D. C.

PATENTS

Write for Free Booklet, HOW TO OBTAIN A PATENT and RECORD OF INVENTION—or send drawing or model for examination.

MILLER & MILLER, Patent Attorneys
Former U. S. Patent Office Examiners
Dept. C, 1006 Woolworth Bldg., N. Y. City
261 McGill Building, Washington, D. C.

Phone WALker 6216

JOHN M. FLOOD MACHINE CO.

INVENTORS' LABORATORY
Designing and Developing
NEW INVENTIONS
EXPERIMENTAL and MODEL WORK
6 VARICK STREET
Cor. Franklin St. New York City

All You Need to Learn TELEGRAPHY

Morse or Continental with **Teleplex**

Learn Telegraphy—the world's most fascinating profession—by hearing real messages—sending them. Interesting, simple—you learn quickly—at HOME.

Teleplex is the Master Teacher. Used by U. S. Army, Navy and leading radio and telegraph Schools.

Write for Folder E-12

TELEPLEX COMPANY
76 Cortlandt St., New York

Yankee Brains at Work

Notice to Readers:

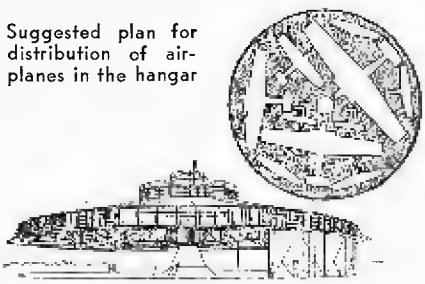
AN appreciable period of time elapses between the filing of a patent and the date upon which the patent is granted. During this interval inventors frequently move. We regret that it is quite impossible for us to supply the correct addresses of persons whose inventions appear on this page, nor can we furnish information about when the product may appear on the market. Attorneys who prosecuted the patent cases can furnish the most reliable data. Copies of patents are available at ten cents each from the U. S. Patent Office, Washington, D. C.

Labor-Saving Circular Airplane Hangar

No. 1,773,656, issued to S. Wasilkowsky

THIS invention relates to a circular airplane hangar whose outside walls are sliding doors so arranged that a plane may be brought in and out at any point on its circumference without disturbing other airplanes. The roof is supported entirely and solely at its middle point by one column, through a new system of bracing. Although not absolutely necessary, a rotary floor is recommended so that planes may be brought out in the most favorable direction.

A great advantage of this type of construction is the ability to use practically all of the enclosed space.

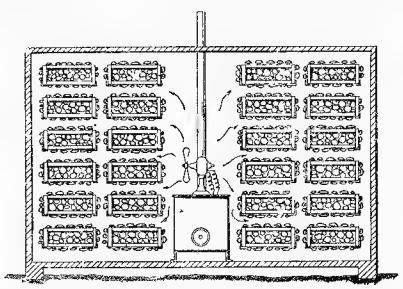


Suggested plan for distribution of airplanes in the hangar

The Best Way to Grow Mushrooms

No. 1,773,643, issued to V. Steves

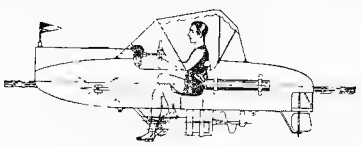
THE purpose of this invention is to provide a suitable means of growing mushrooms. Wire mesh cases containing a mixture of loam, manure and mushroom spawn, constituting the soil in which the mushrooms are to be grown, are so arranged that the fungi will grow on all six sides of each case. A heater or refrigerating device is used to maintain the proper room temperature, so essential to their growth, and the use of a fan is indicated so that the temperature shall be the same in all parts of the chamber. The room is always in total darkness.

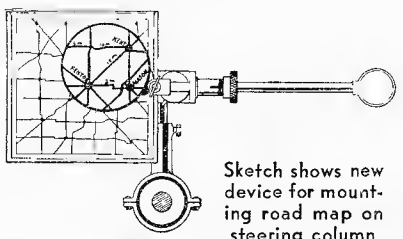


Loop the Loop in the Water—Everyman's Submarine

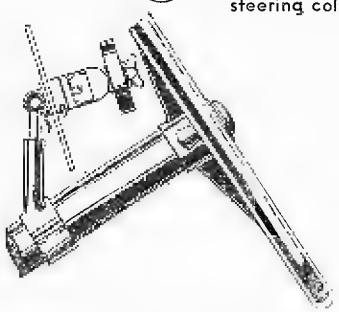
No. 1,773,210, issued to Charles Wallace

A NOVEL type of boat, termed a hydro-sporting machine by the inventor, enables the operator who is seated on a bracket fastened to the side of a bottomless well in the midsection of the ship to proceed on the surface or dive below the surface at will. The craft is provided with air tanks, fore and aft, to maintain buoyancy, a pedal-driven propeller, a rudder at the stern, and diving planes at the bow.





Sketch shows new device for mounting road map on steering column



Find That Road

No. 1,773,337, issued to L. P. Barlow

THE object of this invention is to allow the automobile operator to read road maps easily while driving. The device consists of a map on an adjustable holder which clamps upon the steering wheel post and a movable magnifying glass which can be fixed at any one point, to facilitate reading of print which would be otherwise indistinguishable. For night use a lamp is provided which draws current from the storage battery.

www.americanradiohistory.com

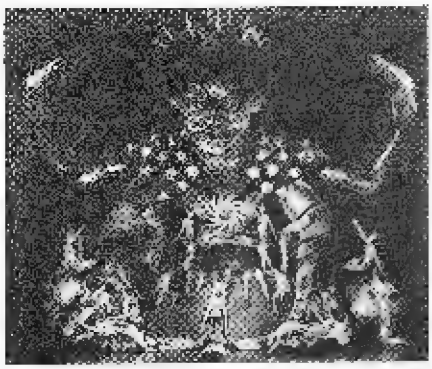
City of the Future

(*Continued from page 686*)

journey in a rocket plane. Only such a daring deed will clinch his claim to the young lady's hand, according to the laws of the time.

Mars is discovered to be inhabited by twin nations, one of which acts from motives of good, and one from motives of evil. The good are in power when the earth inhabitants land, but during their sojourn on the planet, the bad take possession, and this complicates the return to the earth.

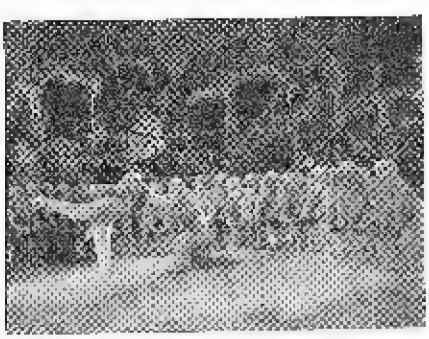
The Martian adventure inclines to spectacular effects, peculiar human and animal types found in the other world.



Interesting view of a Martian form of worship.

A view of the rocket plane is shown in one of the photos. When the aviators boarded the craft it was raised into a vertical position by hydraulic lifts, preparatory to the start. The actual departure of the plane from the earth is depicted with a papier maché miniature, which was propelled with a special powder, and performed much like a skyrocket when ignited.

Airplane views, and glimpses of the rocket in flight were secured by the superimposing method of photography. The background of clouds is first photographed, and an orange print made of this view. Then the airplane is separately "shot" against a blue background. The orange-colored film has meanwhile been inserted in the camera as a photographic filter, and the image of the airplane coming through the filter of clouds, is secured on a new negative. By this means it is possible to obtain a solid image of the airplane rather than the shadowy one of the simple double exposure method. A cyclorama background was also used for portions of the flight of the rocket between the earth and Mars.



Some of the supposed inhabitants of Mars.

PATENTS TRADE-MARKS AND COPYRIGHTS

VICTOR BUILDING
Our New Building Nearly Opposite U. S. Patent Office Specially Erected by Us for Our Own Use

OUR OFFER: FOR THE PROTECTION OF YOUR INVENTION

YOUR FIRST STEP—The inventor should write for our blank form, "RECORD OF INVENTION." Before disclosing your invention, a sketch and description should be made on our "Record of Invention Blank", signed, witnessed, then returned to us and we will place it in our fireproof secret files. **We will also give our opinion** as to whether the invention comes within the Patent Office definition of a patentable invention. This "Record of Invention" will serve as "proof of conception" until the case can be filed in the Patent Office. ***There is no charge or obligation for this service.***

Write for Our Five Books Mailed Free to Inventors

Our Illustrated Guide Book

HOW TO OBTAIN A PATENT

Contains full instructions regarding U. S. Patents, Our Methods, Terms, and 100 Mechanical Movements illustrated and described.

OUR TRADE-MARK BOOK

Shows value and necessity of Trade-Mark Protection. Information regarding TRADE-MARKS AND UNFAIR COMPETITION IN TRADE.

OUR FOREIGN BOOK

We have Direct Agencies in Foreign Countries, and secure Foreign Patents in shortest time and at lowest cost.

PROGRESS OF INVENTION

Description of World's Most Desirable Inventions and Pressing Problems by Leading Scientists and INVENTORS.

DELAYS ARE DANGEROUS IN PATENT MATTERS

TO AVOID DELAY: YOU SHOULD HAVE YOUR CASE MADE SPECIAL IN OUR OFFICE to save correspondence, secure protection and early filing date in Patent Office. You should send us a model, sketch or photograph with a description of your invention together with $25.00 on account. We will make an examination of the U. S. Patent Office records and if it is Patentable we will prepare the official drawings immediately and forward them for approval. If the invention is not patentable we will return the fee less the cost of the examination.

PAYMENT OF FEES IN INSTALLMENTS

It is not necessary that the total cost of a patent be paid in one payment. We permit our clients to pay for their applications in three installments as the preparation of the application progresses in our office.

ALL COMMUNICATIONS AND DATA STRICTLY SECRET AND CONFIDENTIAL. INTERFERENCE AND INFRINGEMENT SUITS PROSECUTED. Our Large, Comprehensive Organization has been established for 30 years and offers Prompt, Efficient and **Personal Service** by experienced Patent Lawyers and Draftsmen. We shall be glad to have you consult us or to answer any questions in regard to Patents, Trademarks or Copyrights without charge.

WE ASSIST OUR CLIENTS TO SELL THEIR PATENTS

Highest References—Prompt Service—Reasonable Terms

WRITE TODAY

FREE COUPON

VICTOR J. EVANS & CO.

Registered Patent Attorneys: Established 1898

MAIN OFFICES: 715 Ninth St., Washington, D. C.

BRANCH OFFICES: 1007 Woolworth Bldg., New York City; 1640-42 Conway Bldg., Chicago, Ill.; 514 Empire Bldg., Pittsburgh, Pa.; 828 Fidelity Phila. Trust Bldg., Philadelphia, Pa.; 1010 Hobart Bldg., San Francisco, Calif.

Gentlemen: Please send me FREE OF CHARGE your books as described above.

Name.....

Address.....

www.americanradiohistory.com

Make it of Metal!
. . . it's easy with
KESTER SOLDER

BUILD your models of metal with solder the modern way . . . airplanes, boats, trucks, toys and many useful articles! It's easy and lots of fun when you use KESTER Metal Mender. KESTER has made soldering simple and quick for everyone. The secret is in the flux right inside the solder itself. You can get KESTER Solder at any hardware dealer in handy Metal Mender tins for 25c, or on 1, 5 and 20 lb. spools or by the foot.

A new thrill awaits you. Be a member of the Metalcrafters of America and win a Metalcraft Merit Medal. Send for our new Book of Prize Projects with complete plans, instructions and sample of Metal Mender FREE! Start now! Write today!

KESTER SOLDER COMPANY
Inc. 1899
4212-19 Wrightwood Ave., Chicago

KESTER
FLUX-CORE
SOLDER

AN INTRODUCTION OFFER ON
WALNUT
BLEND

Middleton's Famous $1.35 Sport Bruyere Pipe, a Generous Package of Walnut Blend, a Tin of Pipe Polish .....

ALL for $1

Men in every walk of life prefer this thundering good tobacco due to its amazing coolness, enticing flavor and excellent aroma. Offer is limited, so you better order yours today. Try *Walnut Blend.*

Ask for our new booklet full of smokers' requisites.

John Middleton, Dept. S
1211 Walnut Street, Philadelphia, Pa.

WANTED MEN
To Manufacture Metal Toys and Novelties

Big demand for Toy Soldiers, Animals, 5 and 10c Store Novelties, Ash trays, etc. We co-operate in selling goods you make, also buy them from you. Small investment needed to start and we help you build up. WE FURNISH COMPLETE OUTFITS and start you in well paying business. Absolutely NO EXPERIENCE and no special place needed. A chance of a lifetime for man with small capital. CHRISTMAS RUSH is now starting, so if you mean strictly business and want to handle wholesale orders now being placed, write AT ONCE for full information.

METAL CAST PRODUCTS CO.
Dept. E 1696, Boston Road, New York City

How to Make A Brass Novelty Box

By George A. Smith

Supervising Principal, Quarryville, Pa., Borough Schools

THIS particular novelty box was made from a piece of a brass pump cylinder four inches in diameter and three and one half inches in height, and a piece of sheet brass one sixteenth of an inch thick and large enough to make two discs each four and a quarter inches in diameter.

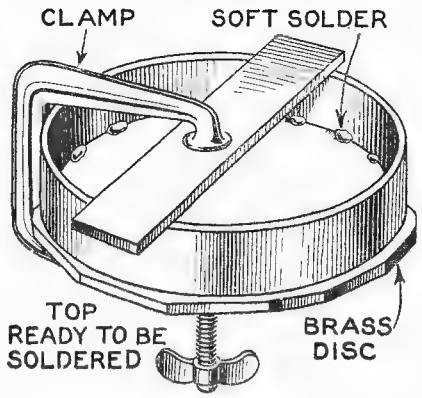


Fig. 1—Top ready to be soldered.

A second-hand brass cylinder was purchased at a plumber's shop and the piece of sheet brass was bought at a hardware store.

The end of the cylinder was filed off and tested for accuracy on a flat top table with the aid of a try square against the lateral surface of the cylinder. A reaming bit with a sharp point was clamped to an upright on a table exactly three quarters of an inch from the table top. The cylinder was then placed against the point of the reamer and moved around on the table until a visible mark was scribed around the cylinder at the exact height. The cylinder was next held firmly against the upright on the table with one hand and a hack saw was used in the other hand in sawing exactly to the mark around the cylinder. A shallow saw cut was first made around the cylinder before the sawing was finally completed. This practice insured more accurate sawing. Three sections were sawed off; two three-quarters of an inch wide and one one and three-quarter inches. Both ends of each of the three sections were filed off and tested for accuracy.

Two circles, one slightly larger than the outside diameter of the cylinder and the other slightly larger than the inside diameter, were marked on the sheet brass and sawed out roughly with a hack saw and dressed down with a file.

The large brass disc was placed on a narrow section of the cylinder and clamped tightly by placing a piece of metal across the open end of the cylinder as shown by Fig. 1. A soldering flux of the paste variety was applied to the inside of the cylinder and pellets of soft solder placed at intervals in the flux. The top was mass soldered to the band by holding the clamped parts over the flame of a blow torch. The outer edge of the top was then filed off evenly with the cylinder.

The second disc was filed off carefully until it fitted into the wide band to form the bottom of the box. A section was sawed out of the other narrow band. The band was made small enough to be forced into the inside of the high cylinder. It was allowed to project above the top one-quarter of an inch in order to form an inside rim for the lid of the box. Flux and solder were applied to the inside of the bottom of the box and to the inside rim and the three parts were mass soldered together. The excess solder was wiped off while hot and the rim was filed to allow the top to be raised off easily.

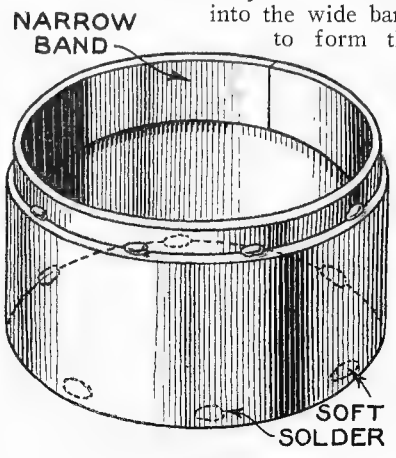
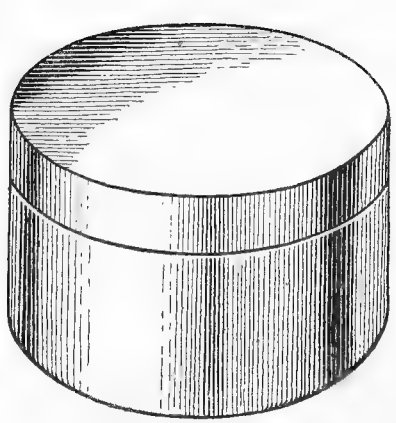


Fig. 2—Bottom ready to be soldered.

A polishing powder was used to put a finishing touch on the box.

This useful and attractive ornament of my own handicraft now graces the top of a bookcase.



FINISHED BOX

www.americanradiohistory.com

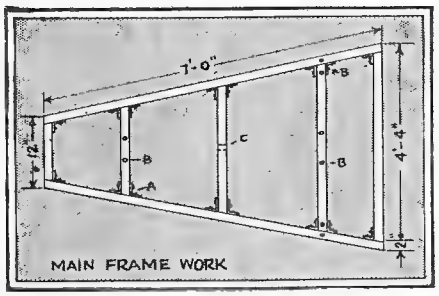
A Sea Sled

(*Continued from page 728*)

box, being sure that it fits snugly.

Give the inside of the pontoon several coats of shellac and a couple of coats of spar varnish before placing the top lid. Also drill two holes in the center brace and insert two four-inch bolts equipped with washers on both ends. Now cover the entire pontoon with a good grade of unbleached muslin and strip all the edges with an extra piece for added strength. Cover this with at least four coats of shellac and two coats of spar varnish and your pontoons are ready to install on the frame by holes bored to accommodate the pontoon bolts.

The rudder may be made about 12″×6″×½″, as pictured in the illustration, and placed on the rear pontoon using two strap hinges, from which the hinge bolt may be removed when the boat is taken ashore or into shallow water. A single long bolt may be used instead of the two short ones. On one of the cross members in the center of the boat is placed a twelve-inch tiller-piece for operating the rudder. The stick is rounded at one end which serves as a handle and drilled at the other end through which the rudder ropes are secured.



Top view of the main frame work of the sea sled.

The stick is secured to the center cross member by one bolt which passes through holes bored in both the cross member and the exact center of the stick.

The boat is now ready for use and will be found to be an endless source of pleasure, especially around a bathing beach. The motor is especially adapted to this purpose, as the gasoline is carried in the base of the motor, a tank of which will run the boat for about four hours, and the electric system is entirely in the flywheel, thereby eliminating the necessity of cumbersome accessories.

$21,000.00 for Spirits

For more than six years this publication has offered prizes totaling $21,000.00 for genuine demonstrations and proofs of spirit manifestations which we cannot duplicate by scientific and well-known means.

Up to the present time not one manifestation has been presented which by even the greatest stretch of the imagination could be considered genuine.

How many more years must this prize be offered? Spiritualists, please answer!

A. C. GILBERT Offers You The Chance of a Lifetime, with his New Up-to-the-minute Experimental Outfits

Revealing the New Mystifying Secrets of Chemistry

Hello Boys!

No. 5009—Combination Chemistry and Glass Blowing Laboratory

Make water from fire! Change the colors of liquids in a flash! Make invisible ink! Produce light from sugar! Yes, you can do these things yourself. And perform hundreds of other modern miracles with my New 1930 Chemistry Outfits.

Lift the lid of one of my outfits and you open up an entirely new world of exciting and fascinating adventure. You can flabbergast your friends with hundreds of magic transformations and experiments. Full instructions and the *complete story of chemistry* are in my Book that comes with every outfit.

For years I have worked to produce a professional chemistry set and an *interesting* book explaining the chemist's secrets, with which boys can do the new things expert chemists have discovered.

All you have to do is follow the clearly written instructions. A barrelful of thrills for the Boy Chemist. Look at Set No. 5009, my *Laboratory* outfit, shown above. It includes 64 chemicals and items of equipment, with the big 240-page Chemistry Manual and the famous Gilbert *Glass Blowing* Manual. Hours of instructive sport, all for $5. Sold at all good toy stores and departments. Other outfits $1 to $20.

Send today for my free "Scientific Mystery", an amazing device that will make you rub your eyes in wonder. Also my free Chemistry catalog with pictures and descriptions of all my Outfits. Just write your name and address on this coupon and mail it today to the A. C. Gilbert Company, 167 Erector Square, New Haven, Conn. Also makers of the famous Erector, Gilbert Mysto Magic, and "Big-Boy" Tool Chests.

A. C. Gilbert

GILBERT CHEMISTRY SETS

No. 5007—Dandy Beginner's Set	$ 1.00
No. 5008—For the advanced young Chemist	3.00
No. 5009—Combination Chemistry and Glass Blowing Laboratory Set	5.00
No. 5009½—Chemistry, Glass Blowing and Chemical Magic.	7.50
No. 5010—DeLuxe Complete Laboratory Set	10.00
No. 5015—Chemistry, Glass Blowing, Chemical Magic and Mineralogy	15.00
No. 5020—Senior Laboratory Set, including Chemistry, Glass Blowing, Chemical Magic, Mineralogy, and Hydraulic and Pneumatic Engineering	20.00

FREE!

The first 50,000 boys who mail this coupon will receive, absolutely free, A. C. Gilbert's "Scientific Mystery"—a device that startles all who follow the directions that come with it. You will also get this new 1930 catalog of Gilbert Chemistry Outfits. Rush the coupon today.

The A. C. Gilbert Company,
167 Erector Square, New Haven, Conn.

Please send me FREE, your "Scientific Mystery" and your catalog on Chemistry Outfits.

Name .....

Street .....

City ..... State .....

www.americanradiohistory.com

You are in demand as an

Aeronautical Draftsman

One of the best paid branches of Aviation is DRAFTING. Draftsmen become designers, engineers and executives. Learn this finest of all branches of drafting right at home. Columbia's new Aeronautical Drafting Course gives you a complete, thorough training—in just a few months. A big standard-size drafting outfit is included without extra charge. Active Employment Dept. helps place you. After taking our course, Lee Turner went with Glenn L. Martin; Wm. Bryant went with Berliner; V. W. McCoy went with U. S. War Dept. Send coupon below for your copy of our free book today.

Tune in on Sta. WJSV, 1460 K. C., 205.4 meter, for Columbia School News!

COLUMBIA SCHOOL

Training in all Branches of Drafting and Engineering for Twenty Years

1319 F St., N. W., Washington, D. C.

Please send me your Free Book, showing how I can learn Aeronautical Drafting at home. S.I. 12.30

Name.....*Age*.....

Address.....

City.....*State*.....

POPULARITY this Year for Christmas

WHAT FINER gift than a sweet-toned, easy-playing Pan-American instrument, that enables you to play tunes immediately . . . join the band or orchestra in a few weeks . . . win popularity, extra income. Choose any instrument. Pan-Americans are factory guaranteed, moderately priced. ***FREE TRIAL, Easy Payments.*** Write for details; name instrument.

PAN-AMERICAN

Band Instrument and Case Co.

1205 Pan-American Bldg., Elkhart, Ind.

Moulds as low as $1.50 each.

Cast Your Own Lead Soldiers, Indians, Hunters, Wild and Farm Animals

235 Wonderful "True to Life" Models. Easy and inexpensive to make. I furnish all necessary material including enamel. Send 5c Stamp for Illustrated Catalogue A.

H. C. Schiercke, 1034-72nd St., Brooklyn, N. Y.

Electricity! Learn in Los Angeles

Be an electrical specialist. Gain quick success in this most fascinating and profitable field. Learn at National in the center of tremendous electrical projects costing more than $100,000,000.00 — unlimited opportunities now.

Practical, intensive training by National's job-experience method in 6 to 9 months. All technical essentials included. School endorsed by leaders in electrical industry. You learn all branches of electricity; radio. Million dollar institution; all modern equipment and training facilities. Life scholarship. No age limit. Free employment service. Over 17,000 successful graduates. 23rd year. Big, illustrated 84-page catalog sent FREE. Write today.

FREE BOOK

NATIONAL ELECTRICAL SCHOOL

Dept. 96 4006 So. Figueroa, Los Angeles, Calif.

Answers and Prize Awards in September Puzzle Contest

First Prize, of $10, is awarded to:
W. Bowman Thrall, Academy, S. Dakota

Second Prize, of $5, is awarded to:
Frank Cole, 410 Orchard Street, New Haven, Conn.

The ten prizes, of one dollar each, are awarded to the following:

J. M. Levin, 2623 Clinton Ave. So., Minneapolis, Minn.

P. W. Boggess, 450 Fairmount Ave., Sunbury, Pa.

Stewart Huey, 100 Ridgefield Ave., Waterbury, Conn.

Hugh Duncan, Buchanan, Va.

Mrs. S. Malkin, 1220 Knox Ave. No., Minneapolis, Minn.

Homer S. Kelsey, Hadlyme, Conn.

Reuben Singman, 5681 Jeanne Mance, Montreal, Que., Canada.

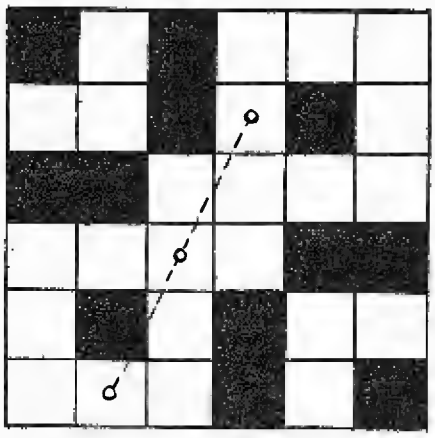
L. G. Cabrera R. F. D. 1, Box 275, El Paso, Texas.

G. R. Knauts, 216 Thompson St., El Dorado, Arkansas.

E. B. Escott, 1019 S. East Ave., Oak Park, Ill.

Solution to "Ann Hathaway's Puzzle"

If Ann Hathaway's little brothers played out their game without violating the rule that not more than two panes should be eliminated from any row, obviously the maximum number selected for removal in the 6 by 6 square window would be 12.



The accompanying diagram illustrates how these twelve panes may be selected without violating any conditions, including the one that from no point of the window's border are three empty squares to be found in straight line.

There are other possible arrangements of the twelve squares which do not violate the condition of having no more than two in rows, columns or regular diagonals, but which do not stand the test of irregular diagonals. For example, those three circles, which are apart from the solution, are in straight line, although no two are in the same row, column or regular diagonal.

Solution to "Senatorial Discretion"

The Senator's mixings of wine and water can best be resolved into definite quantities by working backwards.

The final pouring left a like quantity in either container; which quantity we shall call X quarts.

Since the wine demijohn's contents were doubled by that final pouring, previously it must have contained ½ X quarts, and the water demijohn 1½ X quarts. Another step backward in the operations establishes that after the first pouring the wine demijohn, doubled in contents, held 1¼ X quarts and the water demijohn ¾ X quarts. Another backward move and we have the two demijohns in their original condition. Then the wine demijohn contained ⅝ X quarts of wine and the water demijohn 1⅜ X quarts of water.

After the first pouring, the wine demijohn contained equal parts of wine and water. Then, when it was reduced to ½ X quarts, it still was a 50 per cent. mixture. At this stage the water demijohn contained 1⅜ X quarts of water and ⅜ X quarts of wine. One-half X quarts of the mixture was then poured into the wine demijohn, and in keeping with the proportions of wine and water, the wine demijohn received ⅛ X quarts of wine and ⅜ X quarts of water.

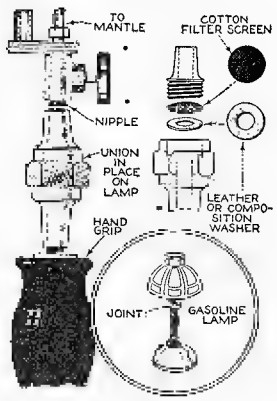
Thus we have proved that the wine demijohn's X quarts of liquid consisted of ⅜ X quarts of wine and ⅝ X quarts of water. Since the difference between wine and water, ¼ X quarts, was equal to 3 quarts, we have established the value of X as 12 quarts.

At the beginning the water demijohn contained 16½ quarts of water and the wine demijohn 7½ quarts of wine.

At the conclusion of manipulations, the wine demijohn contained 4½ quarts of wine and 7½ quarts of water. The water demijohn then contained 3 quarts of wine and 9 quarts of water.

Efficient Gasoline Lamp Filter

GASOLINE lamps have the disagreeable characteristic of becoming clogged after they have been in service for a short while. An easy method of eliminating this difficulty is to scrap the connection between the handgrip and the lamp proper.



Detailed view of the construction of the filter and its various parts; how the lamp should look after the device has been assembled.

A brass union and a nickel plated closeup nipple should be substituted. The union must be opened and a washer inserted through whose center a good sized hole should be cut. A circular piece of close weave cotton cloth is cut to fit over the washer and the union is again screwed together.

The cotton will act as a filter and catch all dirt and sediment which would otherwise pass through and clog the lamp.

A new cloth may be inserted every month.—*Thomas Webster.*

www.americanradiohistory.com

FORECAST

By the Official Forecaster

WHAT is it? That is the question you will ask yourself when you see the cover of the January issue of SCIENCE AND INVENTION. We modestly admit we certainly did choose a corker this time and, since you will be just as anxious as we were ourselves to solve the mystery, it's an even bet your first action will be to turn to the page indicated to learn what it is all about.

THE French scientist, Dr. Georges Claude, has been much in the news of late on account of his experiments to turn to useful account the fact that a wide difference of temperature exists between the surface of tropical oceans and the water at a considerable depth. So far, his efforts have, after an initial run of bad luck, met with a very fair amount of success. Look in next month's issue for a full explanation of the methods he uses, and the principle upon which they are based. The article will be fully illustrated with photographs and diagrams.

DO you know How and Why Automobile Tires Wear Out? Yes, of course, you can advance several explanations, probably all correct as far as they go. But that isn't the half of it. The number of factors which conspire to produce wear in tires is truly amazing. Don't miss this illuminating article in the January issue.

EVERYBODY is familiar with the glow worm. But did you know that in New Zealand there is a great **grotto** where these curious products of Nature are so enormously plentiful that the grotto is **illuminated by them?** Read about this wonderful natural phenomenon which is unknown anywhere else in the world.

AMONGST other interesting features in the January issue of SCIENCE AND INVENTION will be a description of **How Science Saved Our Sugar Industry; Back Tracking Along the Racial Trail,** an exploration story of the Lubinsky expedition into Kazakstan, in North Central Asia and Siberia, where Shaman priests sacrifice horses to spirits in the foot-hills of the Altai Range.

SOME Amazing Partnerships in Nature tells how the Egyptian plover and the alligator, the ants and aphides, pilot fish and sharks, the fly grub and the wasp, live and work in partnership for their mutual well-being.

IN the "How to Make It" section there will be an article on **Boomerangs, How to Make and Throw Them.**

YOU'VE all read the gruesome details of the French Revolution. Next month we will tell you how to make an exact model of a 17th Century guillotine which, when completed, will serve the less gruesome purpose of snicking the end off your cigar.

ANOTHER article will tell you how to make a band saw of laminated wood, and H. L. Weatherby provides a corking article on how to make a revolving book table out of a piano stool.

$100 Coach Model

That Any School Boy Can Build in a Few Hours for $4.98

Size: 24" long
8" high
6" wide

An Excellent Christmas Gift—Profitable Pastime

Realizing the demand for coach models, but that the prices charged by exclusive stores are too high for most people, we have made it possible for everyone to own one or more of these early conveyances which helped write the country's history.

We supply you with all the parts, cut to fit and ready to assemble, with a diagram and instruction sheet written so that anyone may easily follow. Each part is numbered and the corresponding numbers on the diagram show you just where to place them. No tools are needed except a small tack hammer. Beside the illustration above we have parts for the following: **Tally-Ho, Devonport to London coach, Deadwood stage coach, Covered wagon** . . . at $4.98 each (*less horses*).

Guarantee: If after assembling our coach model according to our instructions you are not satisfied, return it to us and we will immediately refund your money. You to be the sole judge.

HISTORICAL COACH MODELS, INC., Dept. SI

2206 FAIRMOUNT AVENUE PHILADELPHIA, PA.

Historical Coach Models, Inc., Dept. SI
2206 Fairmount Ave., Philadelphia, Pa.

Sirs:

Please send me complete parts, cut to fit and ready to put together for:
Geo. Washington Coach ☐; Tally-Ho ☐; Devonport to London coach ☐; Deadwood coach ☐; Covered wagon ☐. Send me FREE CATALOG ☐.

I agree to pay the postman $4.98 plus postage. Foreign orders to be accompanied by U. S. money order or check.

Name .....

Address .....

City ..... State .....

New York Electrical School

Established 1902

Ask for free booklet

29 West 17th St., New York City

LEARN TO FLY!

Come to Washington—Center of Aviation. Nation's leading Flying Club. Not for profit. Transport Pilot instructors. Licensed ships. Per hour rates: Dual instruction, $16.00; Solo, $11.00. Send 2-cent stamp for circular.

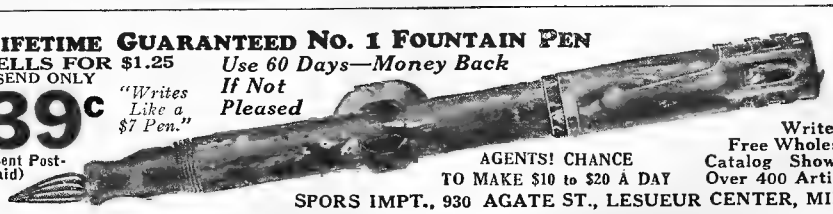
D. C. AIR LEGION
International Building Washington, D. C.

LIFETIME GUARANTEED No. 1 FOUNTAIN PEN

SELLS FOR $1.25
SEND ONLY **39c** (Sent Post-Paid)

"Writes Like a $7 Pen."

Use 60 Days—Money Back If Not Pleased



AGENTS! CHANCE TO MAKE $10 to $20 A DAY

Write for Free Wholesale Catalog Showing Over 400 Articles

SPORS IMPT., 930 AGATE ST., LESUEUR CENTER, MINN.

www.americanradiohistory.com

Not Only!

good tools
but
GOOD GLUE

No Workshop is Complete without

CASCO
Waterproof
GLUE

The Strongest Glue Known

A good glue is as necessary as good tools for jobs built to endure.

CASCO fills every gluing need—It will safeguard *your* work, the same as it has been doing for many years for all leading woodwork manufacturers — it glues permanently.

A **CASCO** glued joint stands up, outside or inside, in any climate because

CASCO GLUE IS WATER PROOF

SEND FOR SAMPLE

This interesting and helpful folder of **CASCO** USES—as a Glue—as a Size—as a Binder—will be sent with sample.

CASCO is an all-glue dry powder — simply mix in cold water and apply.

NO HEATING
NO ODOR
NO WASTE

CASCO is stocked by hardware, paint and lumber dealers in convenient sizes—

Trial Box.....10c
½ lb. Can.....40c
1 lb. Can.....65c
(Also available in 5 & 10 lb. Bags)

DEALERS: Special **CASCO** Assorted Carton contains all sizes—at leading jobbers.

MANUFACTURERS: Consult us on your gluing problems.

THE CASEIN MANUFACTURING COMPANY
of America, Inc.
205 East 42nd Street, New York

THE CASEIN MANUFACTURING COMPANY
OF AMERICA, INC.
205 East 42nd Street, New York

Enclosed find 10¢ (stamps only) for which send me your trial package of CASCO WATERPROOF GLUE.

Name _____

Street _____

City _____ *State* _____

Hardware, Paint or Lumber Dealer's Name (Please include)

_____

G1230

How to Build This Record-Breaking Outboard Boat

(*Continued from page 701*)

edges beveled for the stern and outer sterns. The well sides are fastened to the outer sterns with No. 10 1½-inch screws. These well sides should be fastened to the stern after the rest of the framework has been set up. Tack a temporary spreader across their bottom edges near No. 13 station and center them by sighting forward along the center line cord. The short outer sterns can best be put in after the chines and reefing chines are in place, which we will come to next.

Now for the bottom and side stringers such as battens, chines, sheers, etc. The work of putting on the bottom battens is so simple as to need little explanation other than a caution in fitting the battens to each notch. You may find the battens are slightly above the edge of the bottom frames that they are notched into. Shave down the notches in the bottom frames until all the battens are perfectly flush in order that the planking may bear evenly on both the frames and the battens when fastened in place. Each batten should be fastened with one No. 6, 1-inch screw, except where the battens end at the step and stern where it is best to use two screws. These latter notches should be well marine glued, and the battens should fit snugly in the notches.

Bottom view of outboard boat showing step and construction.

For the reefing chines on the forward and after planes, the same applies to the fitting and fastening as with the seam battens except that the fastenings are to be No. 8 with 1¼-inch screws. You will notice that the after reefing chines continue past the stern at No. 10 frame through to the outer stern at No. 11, whereas the bottom battens of the after plane stop at No. 10 and short battens are substituted from No. 10 to No. 11 stations for the booster planes. As the non-tripping chine planks both fore and aft of the step are reefed along the reefing chine, it is necessary to put a filler on top of the inner half of the reefing chines so that the third plank out from the keel will bear evenly against this filler chine.

The filler chines forward of the step are full ½-inch thickness from No. 7 to No. 4 frame and from there to just forward of No. 2 frame—where they disappear—they are planed down gradually to their forward end as required by the depth of the reef at each frame. The after reefing chines, except that they are ¾-inch instead of ½-inch, are tapered forward in the same way from their full thickness at No. 10 frame to no thickness at the step. The fastenings for the after filler chines are No. 6, 1-inch screws at the full thickness and No. 5, ¾-inch screws forward where they taper thinner. The same fastenings are used for the after filler chines except that some No. 8, 1¼-inch screws will be needed at the full thickness near the stern. The non-tripping chines are continuous from stem to outer sterns, there being no break at the step. They are screw fastened to the side frames using one No. 8, 1¼-inch screw at each frame, and they are beveled off after being put in place to the same angle as the bottom non-tripping chine plank. You will notice that this bevel changes abruptly at the step. The sheer clamp is fastened in the same manner, being also screwed to the breast hook as well as to the stem, and it continues by the stern at station No. 10. From there a sheer clamp filler cut to the curve of the ship planking must be run to the outer stern at station No. 11. In bending around the sheers, there is considerable pressure against the ends of the side frames, so it is best to run temporary spreaders under the chassis frames and fastened to them, and temporarily fastened to the ends of the side frames to hold them exactly plumb during the building.

Now for the planking. One plank is used to each side, and being but ¼-inch thick, easily bends around the full bow. When in place you can trim off along the sheer and chine, giving the plank exactly the same bevel as the sheer and chine clamps so that the non-tripping bottom planks and the decking will meet evenly. At the stem, the first side plank which is put on is allowed to run by and is trimmed off on a bevel exactly the same as the opposite side of the stem, so that the other side planking can run by the first one making a tight, even stem joint, and then it can be trimmed off flat to take a 5/16-inch half-round stem band. The fastenings for the side planking are to be No. 5, ¾-inch screws into the side frames on about 2-inch centers. At the stem, stern, and outer sterns, No. 6, 1-inch screws are to be used. The plank fastenings along the chine and sheer clamps are to be Doane Copper Clinch Fastenings 1 inch long, or light copper

www.americanradiohistory.com

along the sheer, staggering the fastenings, so as not to be in line with the grain. Except for slight fitting of the non-tripping chine planks along the side of the filler chines, the bottom planking has practically straight edges.

Do not try to fit planks too close to each other, as some little room should be allowed for swelling—about 1/32 of an inch. All the battens and chines are thoroughly coated with special aviation marine glue, only enough being required, however, to cover the batten surfaces thoroughly. The screw fastenings into the bottom frames for the bottom planking are to be No. 5, ¾-inch on about 2-inch centers except where the planks trim off at the chines, step, stern and outer stern, where No. 6, 1-inch screws are to be used. Along the battens, fastenings should be Doane Special Copper Clinch Fastenings 1 inch long or copper nails to clinch over about ¼ inch, being sure to always clinch against the grain and to stagger the fastenings so as not to be in line with the grain. Unless this is done there is a possibility of the wood splitting.

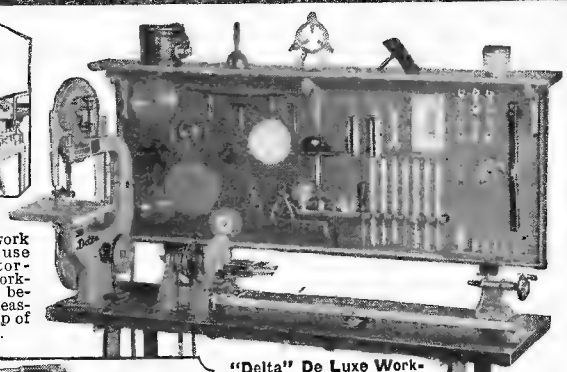
Loosening the Chassis

Now you can loosen your chassis frames from your supports and turn the hull over. Before it gets filled with shavings and sawdust, give it two coats of half-and-half turpentine and boiled linseed oil all over the inside. Now you can put in your flooring, using No. 8, 1¼-inch screws and install your deck cleats and cap beams. You will find it much easier to put these deck cleat assemblies together from station No. 5 forward, from the full size patterns instead of putting each member separately in place on the hull. The details of these deck assemblies are so simple as to require no comment except to say that the fastenings are to be No. 6, 1-inch screws located as shown. Put all these temporarily in place, and by laying a batten fore-and-aft along their upper edges determine whether they will make a fair and even deck. The deck battens are run in approximately as shown on the frame plan and fastened with No. 5 ¾-inch screws, using one fastening to each frame. From the stern No. 10, to the outer sterns, the deck can be made of ¼-inch wood instead of cloth, if you prefer. The grain, of course, should run athwartship for easy bending. The coaming is in one piece from No. 10 forward, the coaming being 5 inches wide in way of the cockpit and 2 inches wide at No. 5, narrowing toward the stem as indicated by the cap beams. The fastenings are to be No. 6 1-inch screws and the dash cleat carries the steering wheel dash, the deck dash being held in place by the center deck battens and fastened along its lower edge to the wheel dash.

The deck cloth is next stretched over the deck battens, using one piece for the center cap deck and one piece for each waterway deck, fastening the deck cloth—which is heavy unbleached muslin or 5 oz. duck with ¼-inch copper tacks on one-inch centers along the coaming sheers. The coaming mouldings and the sheer mouldings are now

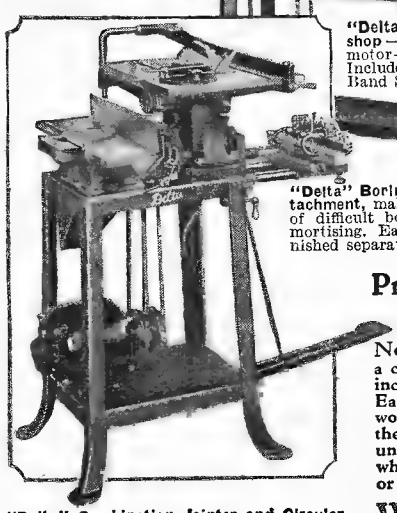
New Units, New Features, New Improvements in Complete 1931 "Delta" Woodworking Line

No more drudgery — no more tedious hand work — when you use "Delta" motor-driven tools. Working with wood becomes a real pleasure with the help of these machines.



"Delta" De Luxe Workshop — the last word in motor-driven workshops. Includes a 4-speed Lathe, Band Saw, Circular Saw, and Jointer.

"Delta" Band Saw has many exclusive features. Provided with special extra-safe guard. Furnished with or without stand.



"Delta" Boring and Routing Attachment, makes child's play out of difficult boring, routing, and mortising. Easy to operate. Furnished separately if desired.

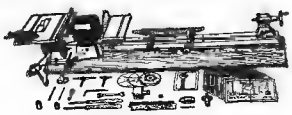
"Delta" Combination Jointer and Circular Saw. Can be operated separately or together — no interference. Furnished with or without motor.

Practical, Motor-Driven Woodworking Equipment Now Within Reach of All

Now are available at astonishingly low price levels a complete series of compact, rugged woodworking machines incorporating numerous exclusive constructional features. Each unit embodies the practical, efficient design, the careful workmanship, the dependable quality of materials—for which the "Delta" trademark stands. This year there are many new units and features that will be of intense interest to all those who works with wood. All units now operate with either electric or gasoline motor power.

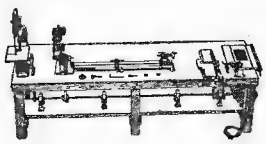
Woodworking—The Modern Way!

Motor-driven tools save time and labor, and produce better work for artisans, farmers and mechanics. Up-to-date craftsmen everywhere are flocking to motor-driven woodworking equipment to eliminate tedious hand labor. And for full or spare-time work, "Delta" Units quickly pay for themselves.



"Delta" Handi-Shop

A complete, compact, practical, motor-driven workshop—popularly priced. Includes equipment for wood-turning, circular-sawing, scroll-sawing, boring, sanding, grinding, and buffing.



"Delta" Line-Shaft Shop

Includes 4-speed Lathe, Band Saw, Jointer, and Circular Saw. Operates with either gasoline or electric motor.

10 Day Trial—Easy Terms

Send coupon today for free illustrated literature describing the new 1931 "Delta" line. Also details of 10-Day Trial Offer and Easy Payment Plan.

DELTA SPECIALTY COMPANY (Division of Delta Mfg. Co.)
1661-67 Holton Street Dept. C.1230 Milwaukee, Wis.

DELTA SPECIALTY CO., 1661-67 Holton Street
Milwaukee, Wisconsin, Dept. C.1230

Gentlemen: Please send me FREE illustrated literature describing 1931 "Delta" line and details of 10-day Trial Offer and Easy Payment Plan. (Check items of particular interest.)

☐ "DeLuxe" Shop ☐ Band Saw ☐ Jointer
☐ Handi-Shop ☐ Line-Shaft Shop ☐ Circular Saw
☐ Routing Machine ☐ Moulding Cutter

Name.....

Address.....

.....Age.....

A Confidential Word for Men

Medical Science has made possible protection against those infectious diseases to which men are peculiarly subject. SANITUBES, the handy prophylactic, are endorsed by physicians everywhere.

SANITUBES are now packed three in a plain pocket-size envelope. Order a package to-day and protect yourself.

Clip coupon and mail for 3 Sanitubes in plain envelope. Interesting booklet FREE. $1

The Sanitube Company
Dept. S, Newport, R. I.

Enclosed is $1 for 3 Sanitubes, in pocket package, plain envelope, and your free booklet.

Name .....

Address .....

.....

www.americanradiohistory.com

GANGWAY! for Strong Men! Weaklings Stand Aside

You won't be regarded as a real man if you are a slouching, nervous, fidgeting grouch—slinking along, afraid of your shadow, timid in company; pimply-faced—with shifting, cowardly eyes; round-shouldered, with unsteady step; a cold, clammy grip—lacking pep, punch or personality—you simply won't get anywhere. Fellows of this type are not wanted. If you are a weakling, sickly, nervous and always pessimistic—you will feel your inferiority wherever you go. Men will shun you. Women will not be attracted to you. Even dogs will bark at you! It is the penalty you pay for weakness!—but you won't have to pay this price if you will face the facts. It's up to you—to you alone. You can overcome weakness by adopting my famous course in Strongfortism.

STRONGFORTISM

Creates New Energy & Strength

Through STRONGFORTISM men all over the world have been rejuvenated and restored to health and strength after they had suffered untold mental and physical horrors as the inevitable result of neglecting the body, excesses, fast living, and abuse of their physical power.

STRONGFORT Builder of Men

STRONGFORTISM has a record unparalleled—there is no other system, or method, or course that compares with it. Write me frankly of your troubles.

Send for My FREE BOOK

STRONGFORT INSTITUTE
LIONEL STRONGFORT, Director,
Dept. 89, NEWARK, NEW JERSEY, U. S. A.

——Send This Coupon——

Lionel Strongfort, Dept. 89, Newark, N. J.

Please send me free my copy of your new illustrated book, "Promotion and Conservation of Health, Strength and Mental Energy."

My Ailment Is.....

Name.....

Age.....Occupation.....

Street.....

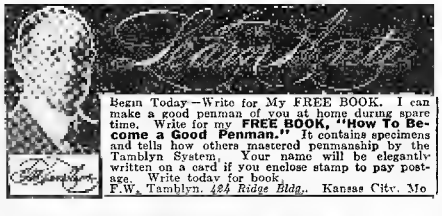
City.....State.....

CLASS PINS 35¢ FREE CATALOG

Either pin, silver plate ··· 35¢ ea.
Sterling silver or gold plate ··· 50¢ ea
1 or 2 colors enamel, any 3 or 4 letters & dates

Lower Prices on Dozen Lots

BASTIAN BROS CO 974 BASTIAN BLDG ROCHESTER N.Y



Begin Today—Write for My FREE BOOK. I can make a good penman of you at home during spare time. Write for my **FREE BOOK, "How To Become a Good Penman."** It contains specimens and tells how others mastered penmanship by the Tamblyn System. Your name will be elegantly written on a card if you enclose stamp to pay postage. Write today for book.
F.W. Tamblyn, 484 Ridge Bldg., Kansas City, Mo

Play the Hawaiian Guitar like the Hawaiians!

Only 4 Motions used in playing this fascinating instrument. Our native Hawaiian Instructors teach you to master them quickly. Pictures show how. Everything explained clearly.

Play in Half Hour After you get the four easy motions you play harmonious chords with very little practice. No previous musical knowledge needed.

Easy Lessons Even if you don't know one note from another, the 52 printed lessons and clear pictures make it easy to learn quickly. Pay as you play.

GIVEN *when you enroll* **a sweet toned HAWAIIAN GUITAR, Carrying Case and Playing Outfit Value $18 to $20** *No extras-everything included*

WRITE AT ONCE for attractive offer and easy terms. A postcard will do. ACT!

TENOR BANJO and other courses. The same thorough instruction on Tenor Banjo, Violin, Tiple, Tenor Guitar, Ukulele, Banjo Ukulele. Well-known instructors. Write for full information.

FIRST HAWAIIAN CONSERVATORY of MUSIC, Inc. 9th Floor, Woolworth Bldg., Dept. 240, New York, N. Y.

Approved as a Correspondence School Under the Laws of the State of New York—Member National Home Study Council.

put on to cover up these tack fastenings and to make a finished-looking job. Two or three coats of white shellac will be found to tighten the deck cloth unless you can get airplane wing dope. For coloring, you can put bronzing powders in the shellac to give it an aluminum effect or any one of the many metallic shades. Finish off the bottom, after thoroughly smoothing off with No. 0 sandpaper, with a graphite composition racing bottom paint. All the natural finished parts of the hull should have three coats of the best spar varnish.

Lumber Specifications

All parts to be cut from Philippine Mahogany (clear spruce may be substituted for frames, long leaf yellow pine for stringers, and white cedar for planking).

Chassis Frames ½-inch by 6 inches.

Chassis Cleats ½-inch by 1¾-inch; except at No. 1 and No. 6 which are ¾-inch thick.

Stems, Sterns and Double Step to be ¾-inch thick.

Stern Girder 1⅛-inch by 2¾-inch; Stern Chassis Cleat 1⅛-inch by 2-inch.

Bottom Frames ½-inch thick in one piece including No. 1 frame and Breast Hook.

Side Frames ½-inch by 2¾-inch, except No. 6 side frames which are ¾-inch thick.

Well Sides ½-inch thick with ¾-inch by 1¾-inch. Stern Cleats.

Chines and Sheers ½-inch by 1⅛-inch in one piece.

Non-Tripping Chines ½-inch by 1¾-inch with ½-inch by 1-inch filler forward and ¾-inch by 1-inch on after step.

Bottom Battens ⅜-inch by 1¾-inch.

Bottom and Side Planks, 5/16-inch thick.

Deck Cleats and Cap Beams ½-inch thick; also Deck Dash.

Deck Battens 5/16-inch by 1⅛-inch.

Coaming ⅜-inch thick. Wheel Dash ¾-inch thick also Dash Cleats.

Flooring ⅜-inch by 6 inches.

Sheer Moulding ⅜-inch half-round.

ARTICLES of this type can cover only in a general way a subject that in many cases calls for detailed treatment. If Mr. Dykes can help you solve any problem regarding hulls, motors, parts, fuels, racing rules, the formation of clubs, or the managing of regattas, let him know. He'll be glad to give you all the information at his command. Write on one side of the paper and enclose a stamped envelope for his reply.

Be brief and specific. Questions likely to interest many outboarders will be answered in these columns. Otherwise your problem will be treated in a personal letter from Mr. Dykes or from some other authority on the subject involved.

Plant Your Bulbs Now

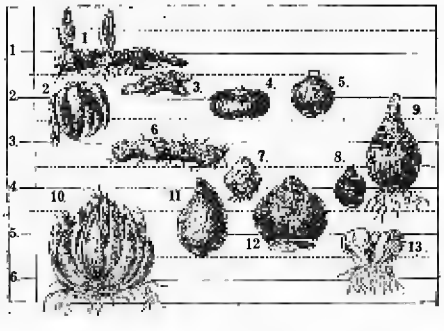
(*Continued from page 689*)

spring. As spring approaches and the worst of the winter is over, it is gradually removed little by little.

The delicate, non-hardy bulbs are taken from the soil about five weeks after the flowering period is over. At this time the foliage will have died back to the ground. This is necessary for the next year's flowers will only be developed in profusion if the bulbs are left in the ground as long as possible and if the leaves remain green for a long time. As soon as the leaves are dead and the bulb is resting, they are dug up and placed in a cool, shady and well-ventilated spot where they may dry slowly. Then, when they are dry, all of the old roots are pruned off and the bulbs are stored in a cool, dry and frost-free cellar. Never store them in a warm place. They would only shrivel up and die. If the storage place is warm and moist, the bulbs may begin to sprout before their time or they may begin to rot; if it is warm and dry then dry rot will kill them.

The bulbs must be dried in a protected spot, but they should not be left there for too long a period for his would injure them. The soil about the bulbs may be shaken off after about two weeks when any remaining stalks are to be pruned off. Then they may be stored. With a little care the bulbs will keep for some time by simply placing them upon some boards. Of course, the best results are obtained if they are covered with dry sand or sawdust.

Hardy bulbs in a fertile soil should not be taken out of the ground. It is just as well to leave them for a number of years. It is just a waste of time to disturb them. During the summer months when these beds would ordinarily be bare, they may be sown over with the seed of annuals.



The depths at which various bulbs should be planted given on the scale in inches. 1—Iris. 2—Ranunculas. 3—Anemone. 4—Crocus. 5—Scilla. 6—Anemore Japonica. 7—Muscari. 8—Galanthus Nivalis. 9—Narcissus Poeticus. 10—Lilium Speciesum. 11—Tulipa. 12—Hyacintus. 13—Fritillaria Meleagris.

The non-hardy bulbs, in storage, should be kept at a temperature of approximately 50 degrees F. If kept below this temperature, the bulbs will, at times, not develop their floral shaft; foliage will be produced in profusion instead. Ventilation is necessary for the stored bulbs because, in spite of the

www.americanradiohistory.com

fact that they are resting, the bulbs do breathe in air and give off moisture. This process produces a certain amount of heat which is favorable for the rot fungus and if it is once established and if the bulbs are not under supervision, the fungus will destroy all of the stored bulbs. The stored bulbs should not receive any light for this tends to promote early growth, especially if no ventilation is provided.

Bulbs with fleshy scales suffer much during the storing period since they are apt to dry out to an exceptional degree. This may be prevented to a great extent by packing in sphagnum moss which is always slightly moist and so protects the bulb from drying too much.

Overhauling the Car

(*Continued from page 720*)

may tighten so that the wheels cannot easily be turned. The screw pressure gun shown in figure (2) presents a solution to clogged grease leads. It comprises a piece of one-eighth inch steel pipe threaded at each end. A body is made of steel pipe tapped with a five-eighth inch machine thread inside. A snug fitting thread is cut on a piece of five-eighth inch cold rolled steel. A bushing is made for one end to secure the one-eighth inch steel pipe. This tool is filled with heavy grease and the rod is turned down solid. If the grease hole can be opened at all, this screw pressure gun will do it quickly.

The gas tank may leak slightly around the filling spout, drain, or in a seam. Before repairing with a torch or even a hot soldering bit, the tank should be made safe. You can do this by inserting a hose in the spout and filling with water. Allow water to flow through for ten or fifteen minutes, then drain the tank and work can proceed safely. It must dry thoroughly before filling with gasoline. Figure (3) explains this process, as well as giving a sketch for repairing. All repairs should be substantial jobs of soldering, the filler spout especially is constantly subjected to strains in filling the tank. The flange of a loose filling spout should be firmly sweated to the body of the tank, using plenty of heat and a surplus of solder.

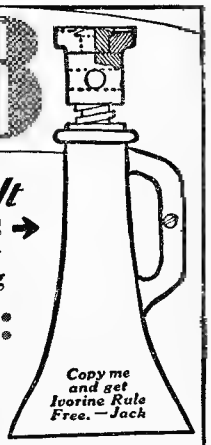
The owner of a car may tighten up an axle nut to the extent of stripping a threaded end usually once, perhaps twice. Obviously, it must be repaired before the car can run again. The usual repair is that of tearing down the rear axle assembly and inserting a new axle-shaft. A quick emergency repair is the one shown in figure (4). First drill a small hole, about an inch and a half deep. A taper reamer is then used to cut a tapered hole. Saw a slit in the screw to the depth of the threaded part. Into the hole is driven solidly a small taper pin. If the pin is greased and driven in solidly, the threaded end will expand. A new axle nut on the axle, cotter pinned so that it will not move, completes the repair. Keep testing the expansion with the nut to know when it is enough. The repair is imperfect as the threaded part is forced out of parallel with the axis of the bolt.

Do You Want To Have and Keep A BETTER JOB

Let Me Train You For It

Copy This Jack

Send sketch at once, if you are 16 or more. I will mail you entirely free Draftsman's Pocket Rule and "My Job-Securing and Pay-Raising Plan." Opportunities for draftsmen are bigger than ever.



JOBS for men I train in drafting HERE:

Auto Work
The automobile industry is one of the greatest in America. Thousands of draftsmen needed. I'll train you for this work.

Electricity
Electricity is the coming motive force of the world. Draftsmen are needed in every department of this fascinating work. I'll train you at home. Get a job here.

Motor Bus Work
Motor bus building and transportation have become leading world industries. Hundreds of draftsmen engaged in this work. I'll show you the way.

Aviation
Aviation is just in its infancy. It is bound to expand to enormous proportions. Draftsmen are essential to it. I'll train you quick at home for drafting position.

Building Work
There will always be building. No structure can be erected without plans drawn by draftsmen. I'll make you an architectural draftsman at home.

My Job-Securing Pay Raising Plan FREE

Here are the tools you get

I send you these fine imported money-making tools as my student.

Why work all your life for small pay and with little chance for a raise or promotion? I'll train you for higher class, cleaner work. Leading to salaries of $60—$70 and up to $100 a week. Get my Job-Securing and Pay-Raising Plan NOW.

This is a very valuable book for young men who want bigger pay. It is not a catalog, but my Job-Securing and Pay-Raising Plan and Money-Making Advice. I prove that John Savadge, trained by me, makes $300 a month. Earl J. Dupree, trained by me, refused $600 a month because he makes more in his own business. A. H Bernier, trained by me, earns $7,000 to $9,000 a year. Arthur De Walt, trained by me, makes more than $400 a month. D. C. Stroop, trained by me, makes $475 a month. L. V. Broughten, trained by me, makes $300 a month. No previous experience needed. You don't have to be a high school graduate.

I Train You at Home
My practical working method makes every step in learning drafting as clear as a moving picture. That's why I train you so fast to be a draftsman.

Money Back If Not Satisfied
I train you under a positive Money-Back Agreement. If my training does not satisfy you after you have finished you get every penny back.

Earn While You Learn
You can start earning money a few weeks after beginning my training. I give you special work and tell you how to make money.

Employment Service
After training you I help you to get a job without charging you a cent for this service. Employers of draftsmen come to me for men because they know that men I train make good.

Mail this COUPON If You Earn Less Than $70 a Week

Mail this coupon now, and I will send you "My Job-Securing and Pay-Raising Plan", Drafting Book and Draftsman's Pocket Rule—postpaid and free.

ENGINEER DOBE, 1951 Lawrence Avenue Div. 14-29 Chicago, Ill

FREE JOB-SECURING PLAN

ENGINEER DOBE, Div. 14-29
1951 Lawrence Ave., Chicago

Send me free of all cost, "My Job-Securing and Pay-Raising Plan", also FREE Drafting Book and Draftsman's Pocket Rule. All FREE.

Name ..... Age .....

Address .....

Post Office ..... State .....

You'll bring in scores of new stations using Radex. It's "the greatest book they've ever seen" write hundreds. Gives you the ideal log; complete time-table of all chain programs; and other keenly interesting data.

Logged 2400-mile-away Station

Radex gives the radio a new "kick." Don't miss having it. Your news dealer, radio store or Kresge's has a copy of Radex for you or we'll supply you on receipt of

RADEX PRESS 1105 E. Sixth Cleveland, Ohio

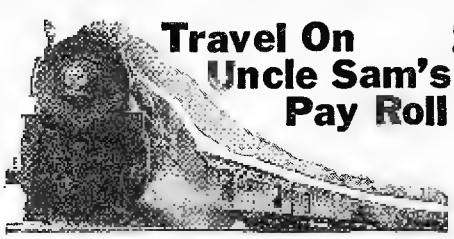
Electrical Engineering

Training for men of ambition and limited time. Concise, comprehensive course in Theoretical and Practical Electrical including Mathematics and Mechanical Drawing. Students construct motors, install wiring, test electrical machinery. A thorough course designed to be completed in one college year.

THIRTY-SEVEN YEARS of successful experience assures you maximum training in minimum time.

Send for free catalog

BLISS ELECTRICAL SCHOOL
152 Chicago Ave., Washington, D.C.



Travel On Uncle Sam's Pay Roll

$1900 Year to Commence

SEE YOUR COUNTRY

MAIL COUPON BEFORE YOU LOSE IT

STEADY WORK—NO LAYOFFS—PAID VACATIONS
Many U. S. Government Jobs Open to Men, Women, 18 to 50

FRANKLIN INSTITUTE, Dept. R-181
Rochester, N. Y.

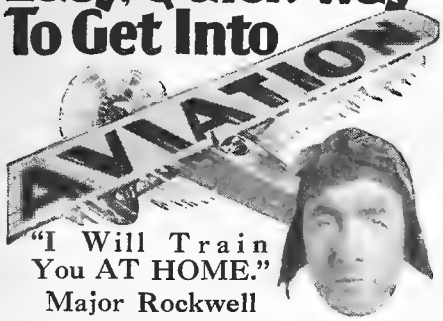
Sirs: Rush to me without charge copy of 32-page book, "How to get U. S Government Jobs," with list of positions obtainable, and full particulars telling how to get them.

Name .....

Address .....

www.americanradiohistory.com

Easy, Quick Way To Get Into AVIATION



"I Will Train You AT HOME."
Major Rockwell

My new, practical, amazing Home Study Course prepares you quickly to fill any of the fascinating Aviation jobs, either on the ground or as a skilled flyer, paying $50 to $150 a week. I train you to succeed quickly, to fill one of the thousands of air and ground jobs now open, and I help you to find your right place in Aviation.

I'll Help You Get Your Job

Learn at home in your spare hours. In 12 short weeks you can be ready to take your flying instructions at greatly reduced rates at any airport near your home, or right here in Dayton. Or you can step into any aviation ground job with my help. Experience or advanced education not necessary. Aviation—the fastest growing industry is calling you! You risk nothing. If you are not satisfied after completing my course I'll refund your tuition. Take the first step by mailing coupon NOW for my big FREE Book and tuition offer.

Major R. L. Rockwell
Dayton School of Aviation
Desk Z-20,
Dayton, Ohio

Mail Coupon for My Book Sent FREE

Major Rockwell,
Dayton School of Aviation, Desk Z-20,
Dayton, Ohio.

Dear Major: Please rush my copy of FREE BOOK.

Name.....
Address.....
Town.....State.....Age.....

The Appreciated Gift--

One that brings cheer every day throughout the year—A GERSTNER Tool Chest for Machinists and Toolmakers.

Choose your own from Free Catalog.

H. GERSTNER & SONS
684 Columbia St., Dayton, Ohio

KEEP POSTED ON RADIO PROGRESS

JOIN THE RADIO INTERNATIONAL GUILD

—now has 60,000 members—who exchange information and tips of value to experimenters, set builders, service men. Also personal news and short wave gossip— membership fifty cents for a year, including subscription to official organ RADIO DESIGN—well known contributors make this quarterly livest of Radio publications. Send 50¢ today and receive current issue together with membership button, identification card and R. I. G. certificate.

Radio International Guild, SC-12, Lawrence, Mass.
Enclosed find 50c. Enroll me as a member of the R. I. G. Send button and Radio Design for one year.

*Name*_____

*Address*_____

Choo Choo-Another $2.40 Profit!

Another HOLLYWOOD knock-out selling hit—the CHOO-CHOO-AUTO HORN. (Pat. Pending.) Closely resembles the sound of a roaring locomotive whistle. Not a toy, nor trick horn, but a real motor car horn—preferable to most others. Hundreds being installed—from FORDS TO LINCOLNS! Sells itself at $4.80—costs you $2.40. NO HOUSE-TO-HOUSE SELLING. Sound it and collect the crowd—and then COLLECT THE MONEY! Agents are actually "cleaning up" on this new hit. Everybody wants one. Installed in 3 minutes by anyone. Be first in your locality with this clever horn.

SEND $2.40 for sample horn or write for details.

PACIFIC COAST PRODUCTS CO., LTD.
Dept. A40, 1616 Cahuenga Blvd., Hollywood, California

Answers to Scientific Problems and Puzzles on Page 730

Pine Needles

Pine needles have been found to have a temperature in winter that is from two to ten degrees above their surroundings.

Which Will Rise Higher?

If a bullet is fired into the center of a block of wood suspended like a pendulum it makes little or no difference whether the bullet is fired horizontally or vertically. The block should rise vertically the same height in both cases. In practice it is customary to fire the bullet horizontally for in that case the rise of the block can be computed from its sidewise deflection.

Does Everything Come Down That Goes Up?

The statement that more of our atmosphere goes up than comes down is true in the sense that water vapor invariably goes up as a part of the atmosphere, but eventually returns as rain, snow, or hail which are liquid and solid forms of water but cannot be considered as constituents of the atmosphere at all. The rise of the other constituents of the atmosphere, nitrogen, oxygen and carbon dioxide, must be balanced by an equal fall of these substances or we would soon find the composition of the air to be changing. The rise of the atmosphere, then, exceeds the fall by an amount equal to the world precipitation—at least 16,000,000 tons per second. Water vapor which is gaseous water is a true constituent of the atmosphere.

Steam or Water?

When steam expands, as it does in the case of a boiler explosion, it does a considerable amount of work pushing back the atmosphere. This work is done at the expense of its own internal molecular energy. As a consequence the steam gets cooler and some of it even condenses. Of course it may later evaporate again.

Are There Tides on Dry Land?

The same forces that produce tides in the ocean also produce tides in the earth. Of course these tides are not so great as those at sea, yet they amount to several inches in the latitude of New York. The daily rise and fall of this great city as well as that of every other is so gradual and the area disturbed is so great that the motion is unnoticed.

How Sensitive Is Your Ear?

Strange as it may seem, we often hear notes for which the corresponding frequencies do not exist outside our own ears. This fact has been shown by generating frequencies such as 200, 300, 400, 500, 600, etc., vibrations per second and simultaneously delivering them to the ear by means of a telephone receiver. The person hearing this combination will report a fundamental note of frequency 100 vibrations per second in spite of the fact that it does not exist. In this case the perception of the 100 cycle note seems to be due to the fact that the common difference frequency between the successive notes is 100 vibrations per second. The 200 and 300 cycle notes may also be suppressed without affecting the fundamental tone, though of course the quality may be changed considerably.

Can An Egg Do This?

An ordinary hen's egg will withstand a pressure of about 500 pounds per square inch. A load of 3000 pounds on a piston 10 square inches in cross section will produce a pressure of only 300 pounds per square inch. Hence the egg will support the load in the manner illustrated.

Insulation

Experiments on the loss of heat from hot-air pipes show conclusively that one or two layers of asbestos paper applied to the pipe will actually increase the loss of heat provided the pipe is in quiet air. The reason for this is found in the fact that a smooth bare pipe is a much poorer radiator of heat than is the rough and porous paper. This difference in radiation rate more than offsets the advantage of low conductivity of asbestos unless there is a considerable draft past the pipes. Only in such a case does the covering with asbestos prove effective.

For the Home Machinist

(*Continued from page 722*)

shank or flutes. The flat drill is made from a bar of steel, one end ground to a drill point with cutting edges and the other center marked. To use the flat drill, the work is chucked and the drill centered in the lathe, a slotted holder is placed in the tool post and by means of a wrench the flat drill is firmly supported in the slotted holder to start drilling, as illustrated. A smaller drilled hole through the work to clear the drill point will serve to keep the drill steady and allow for fast boring.

In castings having cored holes, which are to be bored through, a tool of this type will bore a fairly true hole, even though the cored hole runs out somewhat. For deep holes, the flat drill is much faster and cheaper than twist drills, which may require specially made extension shanks. Also, the diameter can be made exactly as required.

www.americanradiohistory.com

Experiments with Tin

(*Continued from page* 715)

foil is almost entirely lead. Cigarettes, for example, are often packed in paper that is lined with lead-foil.

Boil the mixture slowly for several minutes. You may have to add more acid to dissolve any solid that happens to precipitate. The principal product of the treatment is stannous chloride, $SnCl_2$. Prove the presence of this by pouring a few drops of the treated liquid into a test tube containing mercuric chloride solution, $HgCl_2$. The contents of the test tube will turn dark gradually, if you have converted some of the $SnCl_4$ into $SnCl_2$. The reason for this is that stannous chloride $SnCl_2$ is not very stable. It tends to revert to $SnCl_4$, and will steal chlorine for this purpose from any neighboring chloride, if that is possible. Mixed with $HgCl_2$ it appropriates the latter's chlorine bit by bit, so that fine droplets of mercury, Hg, are left suspended in the solution. If you doubt that the gray matter which has darkened on standing is really mercury, rub some of it with a cloth upon some shiny copper surface—a cent will do. The copper will take on a shiny coat like silver. This is an amalgam which the mercury formed with the copper.

3. Into two test tubes put a little of the stannic chloride solution which you prepared and some which you reduced to stannous chloride by boiling with tin. If you did not succeed in your preparation, dissolve some dry stannous chloride in water and hydrochloric acid. Conduct hydrogen sulphide gas through both solutions and observe the difference in color of the two precipitates. (Note: Hydrogen sulphide preparation is very obnoxious from its odor. Always arrange to make it outdoors or else in a fume-closet.) Stannous sulphide, SnS, is brown, whereas stannic sulphide, SnS_2, is yellow.

4. To some stannous chloride solution in a flask, add some powdered zinc. On standing, a tree-like formation of metallic tin will form. This was called by the ancient alchemists "Arbor Jovis," the Tree of Jupiter.

5. One of the most interesting tests which can be made with the aid of tin is the formation of "Purple of Cassius." It is worth trying, as this experiment is an important analytical test for gold. The materials needed are chlorine water, a solution of stannous chloride in water and hydrochloric acid and a piece of the thin gold leaf which is sold in books for lettering shop windows, for bookbinders and other purposes.

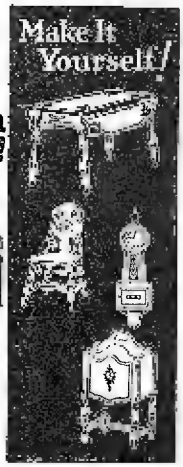
Pick up a fragment of the gold with the moistened end of a glass rod, and transfer it to a test tube. Pour chlorine water along the rod to free the gold. Warm and shake the tube until the gold is dissolved. You have changed it into gold chloride, $AuCl_3$, and the solution will be yellowish.

Take half of this solution and heat it until most of the excess chlorine has passed off. Dilute this with water. Then, drop by drop, add stannous chloride solution. A beautiful violet color should appear.

You'll prefer this Red Jacket compact—improved

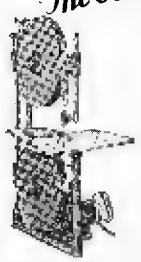
COMPLETE DRILL MOTOR HOME WORKSHOP SET

Enjoy the thrill of your new skill in making things this modern *motorized* way!



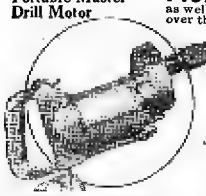
The Only

Complete Interchangeable Power Shop - Improved Features-Exclusive Advantages



Above—45° Tilt Top Table Band Saw

Below—Powerful Portable Master Drill Motor



Now you can do the things you have long wanted to — at home in your own modern motorized workshop—with this new, improved Waco Red Jacket Wonder-Shop. No other compares with it in complete, interchangeable, power features, efficiency, exclusive advantages and quality.

Join the Happy Family of Waco Wonder-Shop Workers

Wm. L. Aylward, Waco's president and nationally known craftsman, has developed his own life's hobby into a cooperative association of thousands of amateur and professional craftsmen. He invites you to join. He will instruct, guide and help you.

The new 1930 Red Jacket Combination brings you the powerful Red Jacket Master Drill Motor, Wood Turning Lathe (capacity 9" x 36"), Compound and 18" Rests, Tilting Top Mitre Saw, Sander Disk, Scroll and Jig Saw, Band Saw, and all accessories for both portable and stationary power drilling, buffing, grinding and cleaning. Attaches to light socket. Converts your work bench into a complete private tool and machine shop. Add new special equipment any time as desired.

Avoid Imitations! Waco Red Jacket is the pioneer—foremost in the field—sold only direct from the factory; not through stores.

Professional Quality and Efficiency. The choice of professional as well as home craftsmen. Red Jacket Shops are making money for their owners all over the country. You can be one of the Red Jacket Guild chain and market your products if you want under our new plan.

TODAY! Send This Coupon for Interesting Facts FREE!

Detailed descriptions and specifications. You will be surprised and fascinated by the possibilities afforded. Just see what you can make and do. Fill in and MAIL TODAY.

WACO TOOL WORKS, Inc.
5216 W. Kinzie Street, Chicago, Ill.

Manager, Dept. 529. Please send me all free information and literature on Red Jacket Assemblies and FREE Services.

Name .....

Address .....

City and State .....

Special Craft Course FREE

All there is to know about handicraft methods, raw materials, carving, turning, sawing, designing, etc., etc., is taught you by correspondence FREE.

FREE Blue Prints

The Waco GUARANTEE

If it is not what you want when you get it—send it back.

You Can Buy NOW on Easy Terms.

Only $10 down. Easy monthly payments. Liberal discount for cash. No hardship to own a Waco Red Jacket.

MAKE MUCH MONEY

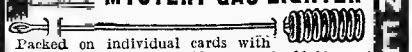
Making and Selling Your Own Products. Formulas, Processes, Trade Secrets. All lines. Automobile Specialties. Cleaning, Polishing Compounds. Food Products. Toilet Preparations, etc. Expert Analytical Service. Catalog, circulars free.

D. THAXLY CO., Washington, D. C.

MONEY MAKE BIG MONEY MONEY

Just out. Lights gas instantly without sparks or flame. Sells like wildfire wherever gas is used. Retails for 25c.

MYSTERY GAS LIGHTER



Packed on individual cards with instructions. Sample 10c or rush $9.00 per Gross or $1 per Dozen. New Method Mfg. Co., Desk SIG-12, New Method Bldg., Bradford, Pa.

December Issue Amazing Stories

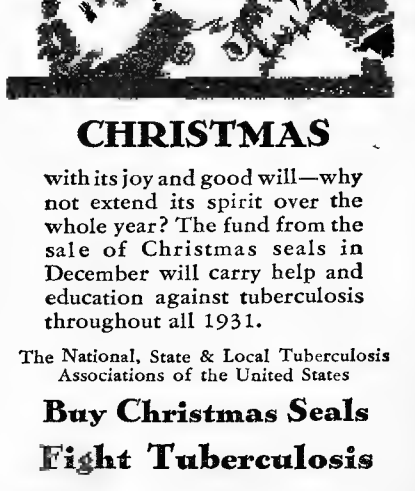
THE ECLIPSE SPECIAL, by William Lemkin, Ph.D. The time for the observation of a total eclipse of the sun is measured by the seconds. And the seconds are so supremely valuable that the scientists, who are busy with their apparatus, do not get a chance to see it. What superb results might be obtained if some means were found to arrange matters so that hours, instead of seconds, could be spent in studying this greatest cosmic phenomenon that ever greets the earth! Dr. Lemkin, himself a scientist, gives us more unique ideas here.

THE SECOND MISSILE, by Earl Repp. Strange and unexplainable matter has been projected to the earth—nobody knows exactly from where. Stories have been written about foreign missiles, but this tale stands alone in its unusual interest.

REAPING THE WHIRLWIND, by I. Tooke. Since time immemorial, there were those called "rain-makers." It is not impossible to some day, comparatively soon, be able to arrange climatic conditions to order. But there are attendant dangers, also.

ANACHRONISM, by Charles Cloukey. Numerous requests have come to us for a sequel to this author's "Paradox" stories. Here it is at last, beyond even the expectations of the fans. Yet those of our readers who have missed the two preceding stories will find in this a fascinating tale of scientific interest, for "Anachronism" is complete in itself.

THE DRUMS OF TAPAJOS, by Capt. S. P. Meek, U. S. A. (A Serial in three parts.) Part II. Those who have read the first instalment of this absorbing novel need no urging to read further. Those of our readers who have missed the previous issue should get it now. There's a treat in store for them.



CHRISTMAS

with its joy and good will—why not extend its spirit over the whole year? The fund from the sale of Christmas seals in December will carry help and education against tuberculosis throughout all 1931.

The National, State & Local Tuberculosis Associations of the United States

Buy Christmas Seals

Fight Tuberculosis

www.americanradiohistory.com

Get Strong!

Eight Improved Muscle Builders

All for $3.75

Easily master feats which now seem difficult. If you want physical culture for health this equipment is what you need. SAVE AT LEAST HALF! We furnish ten cable chest expander adjustable to 200 lbs. resistance. Made of new live extra strength rubber to give resistance needed for sure muscle development. Pair of patented hand grips develop powerful grip and arm. Wall exercising parts develop back, arms and legs. Head strap permits exercise of neck muscles. Develop leg muscles with foot strap—gives speed, endurance. **illustrated course** shows how to develop any part of body.

GUARANTEE Entire satisfaction guaranteed or money back.

SEND NO MONEY

Send name and address. We send all by return mail. Pay postman $3.75 plus postage.

MUSCLEPOWER CO. Dept. SC-12, 150 Nassau Street, New York

SONG WRITERS

NEW BOOK SENT FREE

SONG REQUIREMENTS of TALKING PICTURES

Advance Royalty Payments, New Talking-Picture Song requirements, etc., fully explained in our Free instructive book. Writers of *Words or Music* for songs may submit their work for *free examination and advice.* Past experience unnecessary. We revise, compose, arrange music and secure Copyrights. Our modern method guarantees approval. *Write Today*—Newcomer Associates, 1676-L Broadway, New York, N. Y.

TYPEWRITER ½ Price

Save over ½—Rock Bottom Price on all standard office models—Underwood, Remington, Royal, etc.—Easiest terms ever offered. Also Portables at reduced prices.

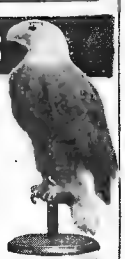
SEND NO MONEY

All late models completely refinished like brand new. *Fully Guaranteed.* Sent on 10 days' trial. Send No Money. Big Free Catalog shows actual machines in full colors. Greatest bargains ever offered. Send at once!!

10-day Trial

International Typewriter Exch., 231 W. Monroe St. Dept. 1293, Chicago

Mount Birds



Learn at Home by Mail Be a taxidermist. Learn to mount BIRDS, ANIMALS, GAME HEADS, FISH. Wonderful fascinating new art. All secrets revealed. Easily, quickly learned by men, women and boys. Decorate home and den with nature's finest art. SPORTSMEN save your trophies.

Big Profits selling your specimens, mounting for sportsmen, or OPEN YOUR OWN SHOP. Big demand—high prices. Sure profits from your spare time.

MOUNT COMMON ANIMALS, like frogs and squirrels, in novelty positions, doing human things, or funny amusing stunts. They sell at sight. Very interesting. We teach you quickly.

FREE! Beautiful, illustrated book, "How to Learn to Mount Game", with dozens of photos of mounted specimens. Free—if you just state your AGE. Write today! Don't delay. Send coupon NOW!

FREE BOOK COUPON

N. W. School of Taxidermy
3799 Elwood Bldg., Omaha, Neb.
Send me your free illustrated book "How to Mount Game." Also tell me how I may learn this fascinating art easily and quickly by mail.

Name.....

Age..... Address.....

Natural Gas

(*Continued from page 697*)

Atlantic coast points, and a 100-mile line from Littleton, Penna., to Washington, D. C.

While many other natural gas pipeline projects are under way the foregoing will give some idea of how fast this new industry is growing. By the end of 1931, 36 of the country's 48 states will have natural gas—those not so supplied by that time being the six New England States, North and South Carolina, Florida, Nevada, Washington and Oregon. It is possible that this list before long will be reduced to five by extension of present trunk line projects into Massachusetts, Connecticut, Rhode Island, North and South Carolina, Oregon and Washington.

The first of the really long-distance gas lines was the 375-mile line that brought natural gas from the Panhandle of Texas to Denver and other Colorado towns. This line was built in 193 days—a record rate of almost two miles per day. Then followed a line from the same Texas region to Kansas City, Mo., and a 431-mile line from the Monroe gas fields of Louisiana to St. Louis, Mo. Two lines now carry natural gas from Kettleman Hills, California, to San Francisco, 190 miles away; and a 22-inch line from the Monroe fields crosses Mississippi and Alabama and ends in Atlanta, Georgia, 461 miles in length.

There need be no concern regarding the future scarcity of natural gas. At present fifty-two great natural gas fields, and many smaller ones, dot the country. The greatest of them in area is the Appalachian field of Pennsylvania, West Virginia, Ohio, and Kentucky. Texas, Indiana, Louisiana, and California also have important fields. A particular field may—in fact, *will* give out in time, but geologists are able to calculate fairly accurately the quantity contained in a field, and long before it shows signs of exhaustion, other fields will have been discovered and wells drilled.

One of the outstanding examples of dependability is that of the Interstate Natural Gas Company's line which, shortly after completion, was flooded for 120 miles by the Mississippi River. Although part of the line was under 40 feet of water, service to New Orleans was never interrupted.

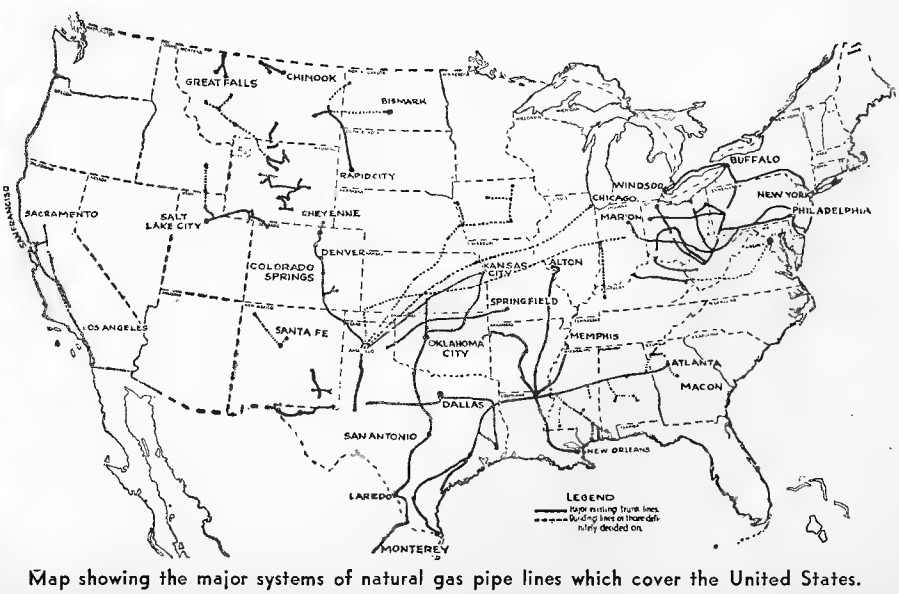
Nearly all gas lines are welded and are given a thorough hydraulic test before being placed in service. Welded lines permit higher pressures in the transmission of the gas. And high compression of the gas means that the line itself acts as a storage reservoir. Consequently, if a break should occur, the line could be shut down for repairs and those in a distant city would be unaware of any trouble.

The United States Bureau of Mines estimates that more than 40,000 miles of trunk pipe lines now carry natural gas to more than 3,500 cities and towns of the United States, which does not include the several thousand miles of lines that will be laid by the end of 1930 and which will add several hundred additional communities.

Industrial consumption of natural gas in 1928, the last year for which definite figures are available, was 1,247,102 million cubic feet, or 78.9 per cent of the total natural gas consumption. Major classifications of industrial consumption that year were:

Oil and gas fields.....	573,698	million	cubic feet
Carbon black industry..	175,137	"	" "
Oil refining	114,950	"	" "
Electric power generation	77,326	"	" "
Miscellaneous	305,991	"	" "

The growing number of public utilities interests that are pushing ahead with natural gas development indicates that a greater volume of gas will shortly be used for electric power generation. Other industries which are adopting the use of natural gas as it is made available to them are those engaged in heat treating of metals, in smelting, and in the glass, food, paint and varnish, ceramic, cement and lime, paper, leather, and enameling industries.



Map showing the major systems of natural gas pipe lines which cover the United States.

www.americanradiohistory.com

Keep Out the Wind

(*Continued from page* 690)

a reduction of the stopping effect, part of the air current passing in straight lines through the openings.

Again, though the best stopping effect is obtained in the case of a maximum number of very narrow slots alternating with bars of equal width, Mr. Falkenthal noted practically perfect checking, i. e., practically perfect windproofness, even with lattices having bars and interstices one and a quarter inches wide approximately.

While it would be particularly interesting to test the behavior of lattice-work having even larger openings—say, about two to three feet wide—such structures being largely made use of in civil engineering, bridge building, etc., these tests would meet with considerable difficulty, even the production of straight air currents of sufficient width being a difficult task.

A remarkable valve effect is noted in the case of lattice-work comprising half-round bars: Whereas an air current striking the round side of the bars hardly meets with any obstacle, there is practically perfect checking on the flat side of the bars.

Mr. Falkenthal had, of late years, twice been called upon to investigate the behavior of lattice-work, gratings, and the like, first, during the world war, when looking for a suitable protection against the wind for microphones used as sound gauges, and, more recently, as an amateur horticulturist, when endeavoring to guard his trees and other plants against the wind, without the use of any light-absorbing glass walls.

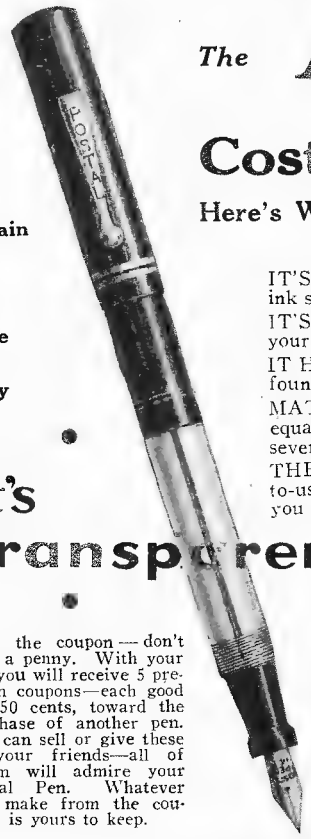
When discussing some of the potential applications of the new phenomenon, as well as some of the uses which it has found already, a distinction should be made according to the stopping effect itself, or else the resulting air pressure, or finally, the accompanying turbulence, is utilized.

The stopping effect, of course, is bound to prove highly beneficial in connection with garden fences, protective walls, etc. It will be used to advantage, also, in the case of airship hangars, mainly with a view to protecting the ship on entering the building against side winds. The fact that the weight of such lattices is only half the weight of a solid wall and greatly facilitates their erection. At the same time, the stopping effect would be decidedly harmful in heating and ventilating, in connection with electrical machinery to be kept at a low temperature by some suitable coating, etc., when round wire (or else half round bar) lattice-work should be used.

Flat bar lattice-work, because of its checking effect, further affords great advantage in connection with any kind of separator, heavy particles descending to the bottom most readily in a slowly moving air current or, even better, in perfectly calm air. In fact, Mr. Falkenthal's lattices have been found to raise the efficiency of separators for most substances to as much as 95 to 98 percent.

SEEING IS BELIEVING

Why Guess About Your Ink Supply?



The Only Fountain Pen With The Visible Ink Supply

it's transparent

The **Postal** RESERVOIR PEN

TELLS YOU AT A GLANCE

Costs Only $2.50

Here's Why It's the World's Foremost Pen Bargain—

IT'S TRANSPARENT—you can always see your ink supply.

IT'S NON-BREAKABLE—you can even step on your Postal without damaging it.

IT HAS TWICE THE INK CAPACITY of any other fountain pen.

MATERIAL AND WORKMANSHIP guaranteed to equal or excel that found in any other pen, selling at several times its cost.

THE PRICE IS LOW only because our manufacturer-to-user sales policy eliminates all in-between profits—you get the benefit.

Mail the coupon — don't send a penny. With your pen you will receive 5 premium coupons—each good for 50 cents, toward the purchase of another pen. You can sell or give these to your friends—all of whom will admire your Postal Pen. Whatever you make from the coupons is yours to keep.

Our Guarantee— Use It Five Days—If It's Not What You Want— Send It Back

Postal Products Co., Inc.,
Dept. H-11,
25 West Broadway,
New York City.

Please send me one Postal Pen and five premium coupons, which I may dispose of at 50 cents each. I will pay postman $2.50 on receipt of pen. If, after 5 days' use, I desire to return the pen, you will refund full purchase price. Check which size wanted—

men's.....women's.....

Name.....

Street and No.....

City and State.....

Semper idem

"ALWAYS THE SAME" . . . a good slogan for any one of a thousand advertised articles whose superior qualities are maintained year in and year out.

Have you ever stopped to consider the time, patience, skill, money and experience invested in every one of the articles you see advertised in this magazine? No matter what it may be—a lead pencil or an expensive automobile—the problems of maintaining and *improving* quality are constantly in the minds of those responsible for their manufacture. Quality must be maintained at all hazards. Quality must be bettered wherever and whenever possible. Price must be kept at a level that will insure the utmost in value.

Advertised goods must, and do, live up to their advertising. "Semper idem"—always the same. They cannot afford to vary in the least.

Trust advertised goods. Buy them regularly. Read advertising to learn what is new. Read it to know what others are buying. Read it to ascertain how you can save money and yet get better merchandise.

Read the advertisements . . . they stand for quality merchandise . . . semper idem

www.americanradiohistory.com

GOOD PAY and UNLIMITED OPPORTUNITY FOR LINCOLN-TRAINED MEN

Men, opportunities for you in aviation are unlimited. Airports, factories and transportation companies must have well trained pilots and mechanics! Leading air transport companies pay an average of $550 per month for pilots. Government-licensed mechanics are in good demand. We train you for licensed mechanic or pilot. Learn right here where Lindbergh learned.

Approved by the U. S. Dept. of Commerce as a Transport, Limited Commercial and Private, both Ground and Flying School. $250,000 worth of buildings and equipment. $100,000 airport, surroundings free from hazards, year round flying weather, fleet of modern training planes. Thoroughly equipped mechanics' school, facory methods taught. Connected with large production aircraft factory.

Our Master Airplane Mechanic's Course equips you for position as mechanic at airport or factory, or to travel in company with a pilot. Then you can earn your way thru a pilot's course while holding a mechanic's job.

Reasonable tuition. Part Time employment Offered while in training.

WRITE FOR CATALOG! Gives full information, with reasonable tuition rates and part time employment offer. Write (stating age) today!

LINCOLN AIRPLANE & FLYING SCHOOL
224 Aircraft Bldg. Lincoln, Nebr.

Home-Study Business Training

Your opportunity will never be bigger than your preparation. Prepare now and reap the rewards of early success. Free 64-Page Books Tell How. Write NOW for book you want, or mail coupon with your name, present position and address in margin today.

- ☐ Higher Accountancy
- ☐ Mod. Salesmanship
- ☐ Traffic Management
- ☐ Rail. Station Mgm't
- ☐ Law: Degree of LL.B.
- ☐ Commercial Law
- ☐ Industrial Mgm't
- ☐ Banking and Finance
- ☐ Telegraphy
- ☐ Business Mgm't
- ☐ Railway Accounting
- ☐ Business Corres.
- ☐ Credit and Collection Correspondence
- ☐ Modern Foremanship
- ☐ Personnel Mgm't
- ☐ Expert Bookkeeping
- ☐ C. P. A. Coaching
- ☐ Business English
- ☐ Commercial Spanish
- ☐ Effective Speaking
- ☐ Stenotypy—Steno'g'y
- ☐ Paper Salesman's Training

LaSalle Extension University, Dept 1294-R, Chicago

NEW SCIENTIFIC WONDER
"X-RAY" CURIO

10c
3-25c
BIG FUN
BOYS You apparently see thru Clothes, Wood, Stone, any object. See Bones in Flesh.
FREE—PKG. RADIO PICTURE FILMS. Takes pictures without camera. "You'll like 'em." 1 pkg. ea. 25c order.
MARVEL MFG. CO., Dept. 83, NEW HAVEN, Conn.

Photography for PLEASURE or PROFIT

A fascinating hobby or a profitable business can now be yours. Prepare quickly at home under the personal guidance of leading experts in the fine art of photography. No experience necessary. Full or spare time. Many earn while learning. Our thorough studio method also qualifies you to fill a well paying position upon graduation. Send coupon below at once for FREE booklet, *Opportunities in Modern Photography.*

AMERICAN SCHOOL OF PHOTOGRAPHY
3601 Michigan Avenue Dept 3429 Chicago, Ill.
Send booklet, *Opportunities in Modern Photography*, and full information.
Name _____
Address _____
City _____ State _____

The Rotor Plane

(*Continued from page 699*)

Immediately behind the propeller, and a little below it, is a single wide-flanged rotor, the object of which is, apparently, to make use of the propellor slip stream to impart to the machine an initial lift to aid the take-off. Once the machine has acquired flying speed the interaction between the rush of air and the two main rotors, which are substituted in place of the orthodox wing, produces a lifting effect, as shown in Fig. 3, which is sufficient to lift the machine into the air and keep it there during flight. The rotors are driven independently of the tractor propeller by an auxilliary air-cooled Gypsy motor which can be seen between the rotors and the cockpits.

Between the propeller motor and the rotors can be seen two outrigged rudders which are evidently intended to ensure lateral stability and reinforce the action of the after rudder which is mounted on the usual form of tail assembly. The undercarriage, or landing gear, is of normal design, and in this particular model a pair of Edo floats is used. The total span of the rotors is somewhat less than the wing span of a conventional plane, so that less storage space is required for the new plane. It is noticeable that the machine has no ailerons.

According to the claims made for the rotor plane, it will lift nearly ten times the load of an airplane of equal weight or lift area, due to the powerful Magnus Effect and at the same time reduce head resistance so that greater speed will be possible when the necessary designs and details have been worked out and tested for structural strength. It is also claimed that it will take off with a much shorter run, and climb more steeply than a conventional plane.

From a safety point of view, the new plane, in its present stage, does not appear to offer the same degree of security as the typical airplane which, in the event of motor failure in midair, can be put into a glide and set down safely. Its wing surfaces will always support it. In the case of the rotor plane, if the tractor motor failed it seems likely that the machine could be brought down safely in an exactly similiar manner, but if the auxiliary motor which drives the rotors failed, it is difficult to see how the machine could remain in the air. Even if it were possible to keep the plane on an even keel by gunning the tractor motor it seems highly probable that the machine would drop too rapidly to enable a bad crack-up to be avoided. And, of course, if both motors failed, the plane would drop like a plummet.

In its present stage of evolution, therefore, the new plane would appear to rely to an unsafe degree on the infallible functioning of its motors. However, it would be unjust to condemn out of hand a meritorious idea which is evidently only in the chrysalis stage, and it is to be hoped that success will ultimately crown the efforts of those who are engaged upon this new pioneering work.

A new radio thrill for you! Listen in DIRECT to London, Paris, Berlin, Buenos Aires and other broadcasting stations throughout the world via short waves. Enjoy unique foreign programs from strange lands. Your ordinary receiver cannot tune in these low wave stations. WORLD-WIDE RECEIVER gets 14 to 550 meter stations with surprising clarity. **SEND NO MONEY!** Just write your name and address on a postcard and ask us to send you this wonderful guaranteed short wave set. Pay postman $6.45 plus a small delivery charge. All orders West of Rockies must be accompanied by $1.00 deposit. Foreign countries must remit in full. Write today!

CHAS. HOODWIN CO
4240 Lincoln Ave., Dept. M-30, CHICAGO

"Concentration"

Learn how to keep your mind on one subject despite interruptions. Great possibilities through thought control. Companion book *"How to Conquer Fear,"* shows how to avoid worry, doubt, anxiety, nervousness; gain contentment. Both wonderful books, by **F. W. SEARS,** $1 postpaid. Satisfaction or money back.

CENTRE PUBLISHING CO.,
1123 Broadway—A-45 New York

Learn to PAINT SIGNS and SHOW CARDS

We quickly teach you by mail, or at school, in spare time. Enormous demand. Big future. Interesting work. Oldest and foremost school.

EARN $50 TO $200 WEEKLY

Otto Wiegand, Md., home-study graduate, made $12,000 from his business in one year. John Vassos, N. Y., gets $25 for a show card. Crawford, B. C., writes: "Earned $200 while taking course." Write for complete information.

DETROIT SCHOOL OF LETTERING
179 Stimson Ave. Est. 1899 DETROIT, MICH.

GEARS

In stock—immediate delivery

Gears, speed reducers, sprockets, thrust bearings, flexible couplings, pulleys, etc. A complete line is carried in our Chicago stock. Can also quote on special gears of any kind. Send us your blue-prints and inquiries.

Write for Catalog No. 40

CHICAGO GEAR WORKS
769-773 W. Jackson Blvd., Chicago, Ill.

IN RADIO NEWS for December

Special Servicemen's Number

Engineering Ingenuity in Production Testing, *by George E. Fleming.*

For servicemen, an inside slant on the various high precision tests given the RCA Radiola Superheterodyne on the production line.

Complete Details on an A.C.-Operated Short-Wave Receiver, *by Alex. Heller.*

How Roxy Uses Radio Principles in Staging His Shows, *by Albert Pfaltz.*

An illuminating article prepared exclusively for RADIO NEWS.

Design Details of the Hammarlund Hi-Q 31 Receiver, *by Donald Lewis.*

Making Modern Vacuum Tubes.

Equipping the New Waldorf Astoria with Radio.

And the regular informative departments:

RADIO NEWS Home Laboratory Experiments.

RADIO NEWS Manufactured Receiver Circuits.

The Junior Radio Guild.

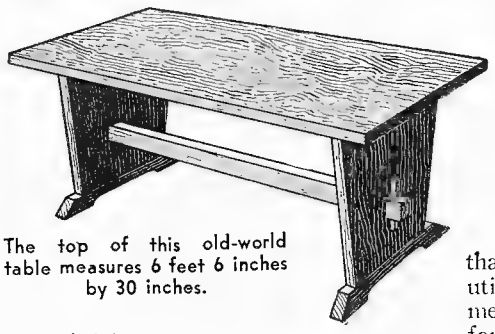
etc.

www.americanradiohistory.com

Converting Your Basement

(*Continued from page 696*)

ment, like most basements of that period, had a long dining room on the west side, and from this, at the south end, opened the wine room and the pantry, each flanked by thick walls. Across a spacious hall on the southeast corner was a kitchen, adjacent to which on the northeast corner was a storage room. The entire basement was floored with brick.



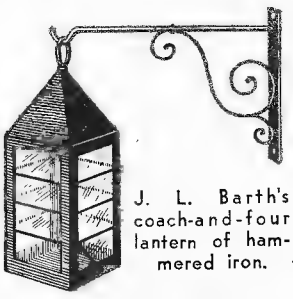
The top of this old-world table measures 6 feet 6 inches by 30 inches.

The dining room was divided into two compartments, one of these being made into a home office and the other into an emergency bedroom. The pantry was retained, but the wine room "being wholly useless under the Volstead regime," was converted into a bathroom. Across the hall the kitchen was turned into a boiler room in which was installed an Oil-O-Matic burner which, by reason of its elimination of smoke, ashes and soot, and as the apartment had ample light from four windows, enabled this room to be utilized as a lounge and smoking room.

The room on the northeast corner was divided into two by a partition. In one room was installed an electrically equipped laundry, and in the other was built a clothes and linen room with ample shelves, hangers and racks.

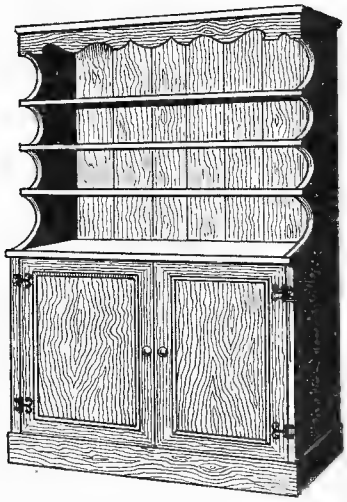
The hall, measuring 17 feet wide by 50 feet long was made into a dancing floor, equipped with an electric radio at one end. The floors of all apartments except the bathroom, which is of tile, the boiler room, laundry and cloak room, which are of smooth finished blocked concrete, are of Georgia pine highly polished and waxed. The walls are painted in a flat coat of soft tan with drop ceilings of a cream color.

The woodwork is finished in a light buff with window sash in white, and with olive-green blinds. The lighting fixtures, both wall and ceiling, are colonial brushed brass, and overhead radiators provide heat for the entire basement, making it thoroughly comfortable in winter, while the 22-inch brick walls make it cool and delightful in summer. A staircase leading up from the hall gives communication to the upper floors, and doors at each end give easy access to the open air.



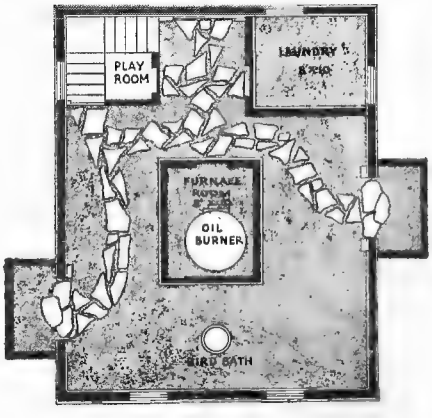
J. L. Barth's coach-and-four lantern of hammered iron.

MARK BEAM, of New York City, one of the Fourth Prize winners, opens his description with the excellent expression of opinion that "waste basement space can best be utilized by designing the entire basement so that every member of the family will be satisfactorily served. The basement should be planned so that it will be dry, comfortable, attractive and practical." Which is another way of saying that the planning of a basement is a strictly personal matter; what suits you and your family excellently will not do for the other fellow and *his* family. We have had this forcibly brought home to us by the wide diversity of plans submitted. Mr. Beam certainly lived up to his own advice in the painstaking care which he took to fulfill all of his self-imposed qualifications. He provides a billiard table, laundry lava-



Mr. Barth's "hutch" cabinet, 54 inches wide by 75 inches high, cut from ¾ inch clear and some knotty pine, finished in oil and rubbed to a smooth age-old finish.

Howard E. Kammerer, of Ottawa, Ill., laid out his basement as an attractive indoor garden, according to the plan below.

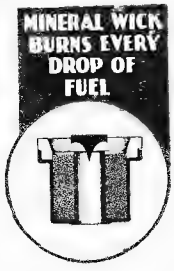


This amazing burner gets

More Heat from Oil

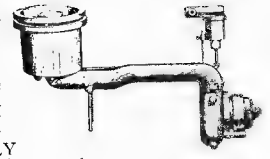
Operates on new scientific principles. Safe, quiet, dependable. Every burner is DOUBLE-INSPECTED and carries approval tag of the Underwriters' laboratories.

By burning oil this new LOW COST way—by eliminating smoke, soot, grease, and other WASTE, the Laco Mineral Wick Oil Burner makes oil heat CHEAP AS COAL. Oil, passing through the red hot porous crystals of the INDESTRUCTIBLE mineral wick is converted into gas. This gas is mixed with air (96% air, 4% gas) and burned with a clean, intense flame. The most economical method of heating known! Many users say that oil heat with a Laco is ACTUALLY CHEAPER THAN COAL! Now safe, dependable, quiet, AUTOMATIC oil heat is within the reach of ALL!



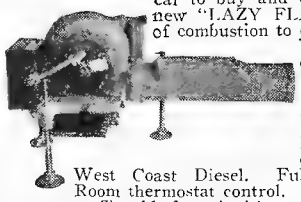
World's Lowest Priced Power Oil Burners

The Laco Jr. fits small furnaces, parlor stoves, Heatrolas, hot water heaters, etc. Heats 2 to 8 rooms. Costs less, and uses less oil than any other burner on the market. Will give years of trouble-free service. Absolutely safe. At $70, it is the World's Lowest Priced Power Burner. Slightly higher with FULLY AUTOMATIC controls.



New Way to Burn Cheap Heavy Oils

Two years ahead of other makes in design, the Laco Model F Atomizing Power Oil Burner completes the Laco Line of burners that are economical to buy and operate. Uses new "LAZY FLAME" method of combustion to eliminate ALL WASTE. Reduces stack temperatures 50%. Gets ALL the heat from cheap, heavy oils, including 24 West Coast Diesel. Fully automatic. Room thermostat control. Only one moving part. Trouble-free ignition system. Fully patented. No other atomizing power burner costs so little to buy and operate!



EASY PAYMENTS

Install Now

Install a Laco Oil burner now—pay later. Small down-payment; easiest terms. WRITE TODAY. Tell type of heating plant you have and size of building to be heated. Special LOW PRICE proposition if you order NOW.

DEALERS WANTED

Get the facts about the SENSATIONAL PROFIT OPPORTUNITY we offer the rated dealer, or man who wants to go in business for himself. Laco has 26 sizes and styles of burners—makes EVERYBODY a prospect. Write (on your letterhead) TODAY!

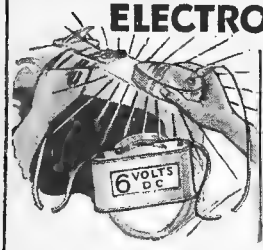
LACO OIL BURNER CO.

One of the world's largest oil burner manufacturers

604 Union St., Griswold, Ia.

www.americanradiohistory.com

ALADDIN PORTABLE ELECTRO-PLATER



Introductory AGENTS OFFER $1.50

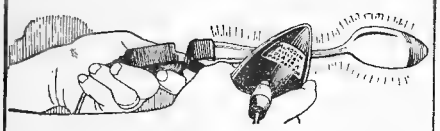
Instantly Applies Real Nickel

Also Electrically Plates Brass, Copper, Silver, Gold, Etc.

With the inexpensive ALADDIN OUTFIT you can easily nickel plate the nickel on your car and do a good job of it. The ALADDIN OUTFIT is also a home necessity.

Make Big Profits With the Aladdin

Whether you are interested in the ALADDIN for yourself or should you wish to go into business putting real nickel on autos or doing metal plating in your neighborhood, or if you would like to act as our agent in your territory, write us immediately for free particulars.



P. J. F. BATENBURG CO.
Dept. 170 Racine, Wisconsin

Agents Wanted

Anti-Mist

Guarantees Clear Vision

You can quickly build a big money making business of your own selling Anti-Mist. Sells to auto supply stores, opticians, druggists, cigar stores, garages, railroads and street car companies. Anti-Mist makes glass FROST-PROOF, STEAM PROOF and WATER-PROOF. One application lasts 24 hours. Clear vision guaranteed in all weather; money back guarantee if it fails.

$50 to $100 WEEKLY Others are doing it. Sells on sight. Anti-Mist retails at 35c for ¾ oz. can $1.50 for 8 oz. can. Send 35c NOW for sample ¾ oz. can and full particulars.

GASTON MFG. CO.
Dept. 863-T, 4214 Lincoln Ave., Chicago, Ill.
Canadian Representatives:
Matty & Co., 615 Pender St. W., Vancouver, B. C.

I Positively Guarantee

to increase your arms one-half inch in size, chest one full inch, strength 25%, health, 100% in one week's time, by following my instructions and using my exerciser 10 minutes mornings and at night. Send $1 for complete course and exercisers. Satisfaction guaranteed or $1 refunded.

Prof. J. A. DRYER
Box 1850-L Chicago, Ill.

SOMETHING DIFFERENT

Mystery Cigar Lighter

MAKE UP TO $25 A DAY

Showing this scientific marvel to men. New principle of ignition. What makes it light? No flint or friction. All guaranteed. Sample with sales plan 25c. Sample gold, silver or chromium plated, $1.00. Agents, write for proposition.

NEW METHOD MFG. CO.
Desk S1-12, New Method Bldg., Bradford, Pa.

BE A DETECTIVE

Make Secret Investigations

EXPERIENCE UNNECESSARY

DETECTIVE Particulars FREE. Write

GEO. STEVE WAGNER, 2190 Broadway, N. Y.

Name.....

Address.....

tory, workshop and furnace, vegetable locker, children's room and even a ladies' room. And all are very excellently laid out.

Angelo Cohn, of Minneapolis, Minn., a Fifth Prize winner, displayed originality in his treatment. By fitting wide floor boards, high wainscoting, beamed ceiling, lanterns, and substituting round port holes for rectangular windows, he made his basement room look like the cabin of a ship, and enhanced the effect by choosing his furnishings accordingly.

Another Fifth Prize winner, E. A. Hungerford, of Harmon-on-Hudson, N. Y., started out with the slogan "A Bigger and Better Basement." One of the first considerations was the garage. "Why on earth should people have to go out of doors to get to their car?" the Hungerford family asked themselves. Why, indeed? It's so much more comfortable to be able to step right into the car without having to brave inclement weather outside. So a two-car garage was provided in the converted basement, the rest of the space being given over to a hall, a heater room, a games room, and a cellar.

Howard F. Kammerer, of Ottawa, Ill., fitted up his basement as a very attractive indoor garden, with the furnace room partitioned off in the centre. This is quite a good idea for garden lovers who, like Mr. Kammerer, live where outside space is scarce.

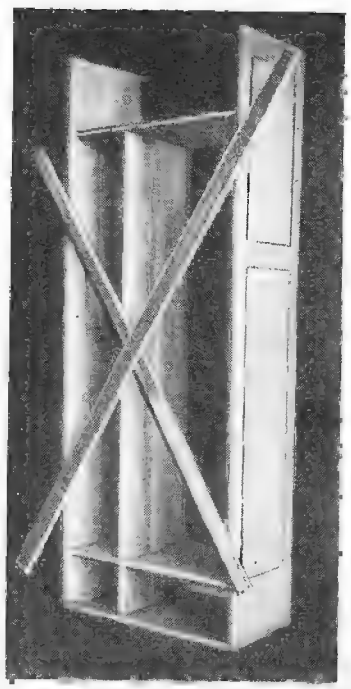
Several entrants fixed up their basements as machine shops. One basement, remodelled by its owner as an apartment at a cost of $1,000, produced $50 a month rent on a four-year lease. Another basement, similarly treated, paid for remodelling in a year.

A Built-in Wardrobe

(*Continued from page* 714)

Having determined these dimensions, which will correspond pretty closely to the ones indicated, the problems of ordering material and construction are next at hand. The wardrobe as planned is designed to fit into a corner of the room. Both sides should be paneled in case it is to be used in the middle of a wall, or away from the corner.

Most homes are trimmed in pine, and as a general thing pine will probably be the most easily secured and cheapest material available. The doors and sides need not be paneled, but can be built up to resemble a panel job. For those who have facilities for grooving, the panels will be more satisfactory however, and the other method is not recommended except where such equipment is lacking. The writer has done many jobs of paneling with hand tools only, so the lack of machinery should stop no one.



Temporarily bracing sides, shelves and vertical partition for further construction.

Plywood panels can be purchased cheaply, if "good one side" or drawer bottom material is bought. The doors and frame for the side should be built of material that runs full one inch or more in thickness dressed, and that is well seasoned and straight. This is very important, for warping or twisting here will prove disastrous.

The back should be built up from tongue and groove ceiling or wide flooring in order to make the case dust and vermin proof.

After the sides, principal shelves and vertical partition have been made up, they may be set in place and temporarily braced for further construction. Squaring up and careful bracing is a very important operation, on which the success of future work depends. Having done this, the fitting of the doors, shelves, top and drawers will be comparatively easy.

The construction of the drawers is clearly shown. Use of small glue blocks on the bottom and at the back simplifies construction, saves nailing into thin material that splits easily, and adds greatly to the strength of construction.

Hardware fittings will depend upon the choice of the builder. All doors should be provided with catches of some sort and a sliding hanger rack should be placed in the suit compartment.

The utility wardrobe has many things to recommend it. It provides ample room for suits and dresses on hangers. The bottom part of this compartment may be used for shoes, and a rack for shoes and slippers can easily be added if desired. The top compartment for hats is sufficiently large for the average family's headgear, while the shelf space below will give space for towels and other linen. The soiled linen compartment is easily accessible, and is fitted with a screen in the top of the door to permit air to circulate and allow damp towels to dry. To finish off at the bottom, we have two drawers which makes the wardrobe really complete and a most useful article of bedroom furniture.

www.americanradiohistory.com

Why Are Circus Freaks?

(*Continued from page* 691)

felt sorry for myself and was badly beaten.

In a New York museum I examined a young woman born without arms, not even a stump. Yet she did some excellent needlework with her toes and wrote on the typewriter, from my dictation, a neat and correct business letter.

It is generally believed that babies are born minus limbs as a result of natural amputations before birth. In the membranous bag in which the child is carried, tight fibrous bands or adhesions may form and break off the delicate limbs early in pregnancy when the child changes its position. On the other hand, it is possible that the limbs never develop at all, for some reason as yet not understood.

At the Coney Island side-shows, we sometimes come across freaks alleged to have bizarre limbs—such as a man with a horse's leg. I saw one such specimen in which close examination readily convinced me that the so-called horse's leg was nothing more than an artificial limb attached to the stump of a normal leg lost in an accident.

Half-woman and Optical Illusion

Another deception is that of the half-woman, cut off at the waist, whom we are allowed to see only inside her cabinet. This is nothing more than an optical illusion produced by an ingenious effect based on the reflection of light by a mirror or on systems explained before in this publication.

Loose-jointed individuals, such as the man who can turn his head completely around without moving his shoulders, are sometimes seen in vaudeville shows. Many acrobats are loose-jointed. The ligaments which hold their joints together are abnormally lax, so that many of them are able to twist their bony knots out of their sockets and then twist them back with the same ease as we might toss a ball. If we attempted to imitate them, we should probably suffer from a serious dislocation requiring the services of a surgeon.

During my college days I received most of my knowledge of dislocations and their treatment from a professional loose-jointed subject, who was able to throw his joints into almost any desired dislocation at will. He himself knew all the approved methods of reduction and, although not a physician, was an able instructor.

The Horned Man of Thibet has a huge wen on his scalp, which happens to assume the shape of a horn. If it were cut open, it would probably be found not to be a true horn. Instead of the conical projection of bone from the skull that forms the basis of an animal's horn, we should probably find a hard collection of material resembling suet. Wens are not rare, but they are usually round or oval.

The bearded ladies represent an exaggerated type of masculine woman. Their features, hands, feet, and general bodily development also resemble those of a man. Yet they are capable of becoming mothers. This is so because the ovaries or sex glands of women have two separate functions: One is to provide the ovum, or female sex cell, which unites with the male germ cell to reproduce a child; the other function, to give to the female body all the characteristics of feminine loveliness, controlled by a substance called a hormone. Failure of this internal secretion gives rise to masculine characteristics in the body.

Women past the change of life frequently develop a hairy growth on the face resembling a slight beard. This is due to the fact that their ovaries have become inactive and fail to supply the hormone, or internal secretion, which makes a woman truly feminine.

What about the man who allows arrows to be shot into his skin without flinching? We cannot account for this feat offhand, but there are several possible explanations.

It is well known that fakirs used to deceive the credulous by coating their hands with a layer of ashes before picking up red hot coals. In some nervous diseases, the sense of pain is completely lost in certain areas of the skin. In such cases I have frequently inserted pins without causing the slightest distress.

Again, it is possible to destroy sensation in certain areas of the body by injecting a solution of a derivative of cocaine into the nerve trunks. The dentist sometimes uses this method to make the whole jaw anesthetic for painful operations. Surgeons perform major operations by this application of this type of anaesthesia.

Most of the Indian fakirs, who excel in this type of demonstration, are able to exclude pain by sheer will power. In their religious pilgrimages, the Hindus subject themselves to the most excruciating self-inflicted tortures in order to expiate their sins.

Hypnotism

I have seen hysterical patients and also normal persons under hypnosis permit themselves to be pricked, cut, burnt and otherwise tortured with perfect indifference. If this trait becomes a constant habit of mind, it would explain the feats of the Indian fakirs.

The human skeleton represents an aggravated type of a rare disease known as progressive muscular atrophy. Throughout his entire body one muscle after another has shriveled and wasted away, until he is now so weak that he can scarcely take care of himself. Some of the men now exhibited as human skeletons were at one time powerful youths. Why their muscles should waste away after this early promise remains a mystery to science.

A visit through the freak museum or circus side-show is not merely an hour spent for idle amusement. It has educational value and teaches us that Nature after all does not always give perfect results.

Boys... for real fun with chemistry—ask for CHEMCRAFT

REGISTERED TRADE MARK

the chemical outfit that gives most for the money!

This is No. 2 $2.00

BE a Boy Chemist—work hundreds of wonderful chemical experiments and produce changes and reactions that will show you the wonders of modern chemistry. You can lead your class in Chemistry, and surprise everybody with your chemical knowledge. It's great fun, and it's easy because CHEMCRAFT is the best chemistry outfit; the original, most complete, accurate and scientific. Contains more and better experiments, superior chemicals and apparatus. All branches of chemistry are included: Inorganic and Organic Chemistry, Electro Chemistry, Glass Blowing, Mineralogy, Metallurgy, Analysis, Industrial Chemistry and Marvelous Chemical Magic. Be sure your new outfit is CHEMCRAFT—

Select Yours from These Fine Sets

No. 1—$1.00 No. 3½—$3.50 No. 10—$10.00
No. 2—$2.00 No. 5 —$5.00 No. 15—$15.00
No. 25 De Luxe Chemical Laboratory—$25.00

(Nos. 5, 10, 15 and 25 come in handsome wood cabinets)

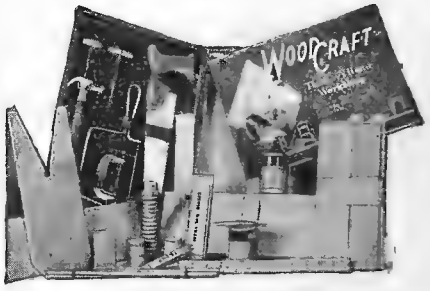
Ask for CHEMCRAFT by name—and look for the name CHEMCRAFT on the box—then you will get the best Outfit.

Try Chemistry for 25c

Get CHEMCRAFT JUNIOR and do lots of fine experiments and magic tricks. It's a wonderful set that shows you what fine fun you can have with CHEMCRAFT. Sent postpaid for only 25 cents.

Write for Free Magazine Mentioned Below

The PORTER CHEMICAL COMPANY
122 East Washington Street, Hagerstown, Md.



Design and Make Many Useful Articles with

WOODCRAFT

WOODCRAFT shows you how to plan, build and decorate many useful things like bookshelves, necktie racks, broom holders and bird houses. Each set is a complete home workshop for boys with good tools, blueprint plans and materials. More than a tool box; WOODCRAFT shows what to do and how to do it. Two size sets, each in strong wood cabinet:

No. 5—$5.00 No. 10—$10.00

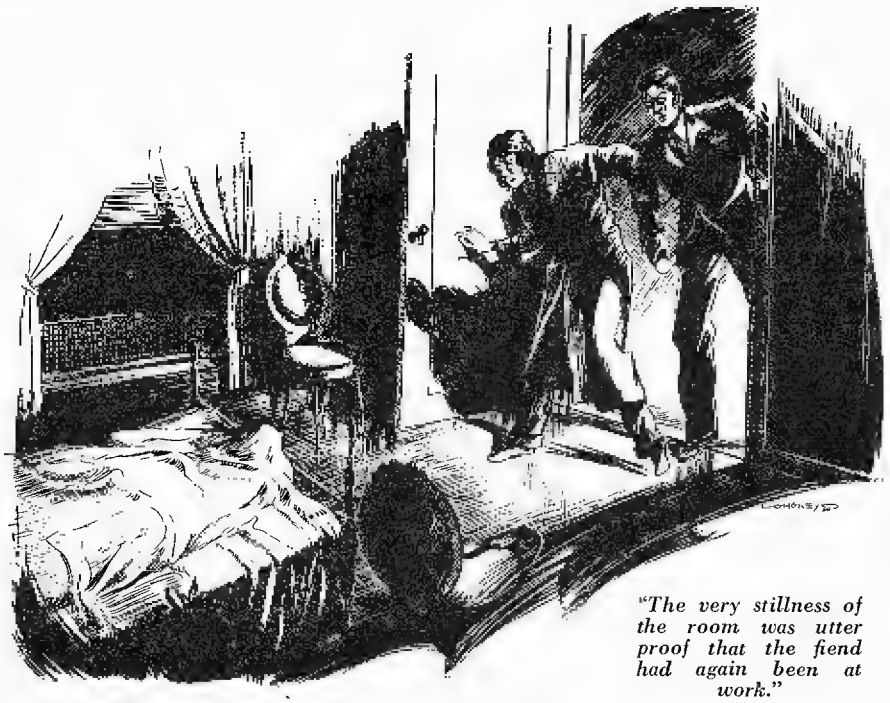
Ask for WOODCRAFT in your favorite store, or order direct from factory.

Write for Free Magazine

Contains interesting experiments you can do at home; also ideas and information on Chemistry and Woodworking. Sent free to any boy.

The PORTER CHEMICAL COMPANY
122 East Washington Street, Hagerstown, Md.

www.americanradiohistory.com



"The very stillness of the room was utter proof that the fiend had again been at work."

The Killings in Carter Cave

ON the night that Mr. Carter, bred a Virginia gentleman, and land wealthy but money poor, opens to the public the mammoth cave discovered recently on his property, he is found cruelly stabbed to death in a hidden recess of the cave by a pointed stalactite.

In the celebration party are the guide, named Lem; a famous geologist; the secretary to the geologist; a newspaper reporter who is in the party in order to describe the newly discovered cave to his paper; a young couple, obviously bride and groom; a well-known actress; and a maiden-lady from Boston. Because of the difficulty in entering the cave, it is practically impossible for any one outside of the party to kill Carter. But at the inquest every one seems to have a perfect alibi. Two members of the party, however, do not believe that the killing was accidental or done by persons unknown. They secretly think it a fiendish plot, carried out for reasons unknown, and set to work to prove their beliefs.

If you were in their shoes, and had the same facts presented to you, what would you do? Could you have prevented the additional crimes that were committed?

Here in "The Killings in Carter Cave" is a complete book-length detective novel, exactly the same sort you pay $2 for in the bookstores. Now you can read it for the first time at only 25c.

Get a copy of Complete Detective Novel for December *today* and settle down to an inexpensive, delightful evening of dramatic, soul-stirring mystery.

Now You Can Read it in December

COMPLETE

DETECTIVE NOVEL

Magazine

ONLY 25c A COPY AT ALL NEWSSTANDS

Testing Roads

(*Continued from page 713*)

loosen it up. It is then mixed with a solvent and the whole is then placed in a centrifugal separator revolving at very high speed, so that the asphalt is completely separated from the sand and stone. The dissolved asphalt passes out through a porous filter ring or washer. Thus an exact specimen is obtained of the kind of asphalt that was used to bind together the stone and sand on a certain piece of road a few days previously. This is then placed in a small metal container and immersed in water at a temperature of 77 degrees Fahrenheit, where it remains for an hour until the temperature of the asphalt equals that of the water.

The sample is now placed under a small needle which bears down on it with a weight of 100 grammes for a period of five seconds, electrically timed. The distance which the needle penetrates into the asphalt is recorded on a dial. This is called the penetration test for consistency. The asphalt has now been so shaped that it can be attached to a mechanism which will stretch it very slowly. The mechanism is contained in a small upright glass vessel which is filled with water maintained at a temperature of 77 degrees. It is stretched so slowly that one cannot perceive the movement. It is drawn into long thin hairs a meter or so in length. It must stretch at least a meter (39.37 inches) to pass this firm's test.

These two tests illustrate, first, the control for consistency, for the needle must not vary in the depth it sinks into the asphalt sample more than half a millimeter. Second, the test for ductility means that it must stretch without breaking.

How Road Is Laid

And prior to all these tests come the primary tests of materials. In the first place rock and bitumen are carefully analyzed and chosen, and the bitumen is subjected to a chemical test. Rock and sand are heated to 300 degrees Fahrenheit to rid them of all moisture. They are then weighed and mixed in definite proportions. The asphalt or bitumen is also heated so that its temperature corresponds to that of the rock and sand. A mixture of rock, sand and asphalt, the whole being two inches thick, is laid on the old macadam road bed which has been prepared to receive it. Over this is placed a mixture of sand and asphalt half an inch in depth. The two mixtures, still at a very high temperature, are then subjected to the pressure of a heavy steam roller so skillfully operated that it maintains perfectly the contour of the street. Under its pressure the two mixtures are united. The rocks are kneaded so that they are firmly set. The top mixture is forced into the thicker stratum below. The result is a tremendously tough composition with fine materials at the very surface to resist abrasion, and sealed against water, and underlaid by a very solid composition containing heavier crushed rock. The whole is compressed into a single piece about two inches in thickness.

www.americanradiohistory.com

Scientific Book Reviews

THE WONDER STORY OF INDUSTRY, by Ellen Friel Baker; published by Thomas Y. Crowell Company, New York. Pages, IX; 308. Price $2.50.

An interesting book for juveniles on how everyday commodities are made, but certainly not conducive toward acting as the vocational guide Miss Baker hopes it will be.

The book consists of twenty-five chapters loosely strung together by relating the experiences of one boy in a large city. Through his uncle, he sees how newspapers, matches, bread, ice, glass, wool, flax and furniture are made. He visits numerous factories and farms and gets a bird's-eye view of each product, from its raw state to the time when it is put on the market. For such articles as rubber, corn, cotton, tea and coffee, whose production it is impossible to follow in a northern city, data is supplied by the uncle. Of course, the chapters which recount actual visits to mills are more interesting than those based on the uncle's knowledge.

Particularly good are the chapters devoted to matches, bread, the silkworm and coal. These contain unusually clear treatment of the subjects, and have some charming anecdotes. However, in the majority of cases when the author attempts to elaborate on the uses of the commodity discussed, nothing is gained, for even a child is familiar with the merchandise she mentions. In order to explain how each of the great industries upon which we depend arose, Miss Baker relates the origin of the product. Her interpretation, while not always in accord with the book reviewer's, is logical and pleasing. As a matter of fact a few more anecdotes like the following would greatly improve future editions of the book:

"Who were the first paper makers, Uncle George?"

"Hornets," grinned his uncle. . . . "Madame Hornet knew the secret of paper-making ages before man found it out. With her strong jaws the mother hornet shaved off tiny bits of wood, chewed it to a pulp, and spread this pulp out thinly, layer upon layer until it dried into the tough, springy paper that makes the hornet's nest."

While of not much value to adults this book is highly recommended for boys and girls between twelve and sixteen. It is written in clear, simple language, and has plenty of dialogue to hold attention. It could have contained a more complete list of materials, and could have treated each one more fully.

HENLEY'S A B C OF GLIDING AND SAILFLYING, Edited by Major Victor W. Page, Air Corps Reserve, U. S. A. Published by The Norman W. Henley Publishing Co., N. Y.; 293 6×9 pages. 72 Illustrations, Indexed. Price, Paper Covers —$1.50. Cloth Binding—$2.00.

Repeated demands for an adequate textbook on motorless airplanes have been amply satisfied by the admirable treatise which is the product of Major Page's pen. Henley's A B C of Gliding and Sailflying, in which is found constructional, operative, and as well as theoretical data, is authoritative yet simple enough for the layman to understand.

The book covers most of the material included in the usual ground course. It is divided into twelve chapters and contains a history of the art of gliding, a discussion relative to the selection of a location for training purposes, and a fully illustrated detailed description of a primary training plane which is especially suited for novices because of its simple construction and stable characteristics.

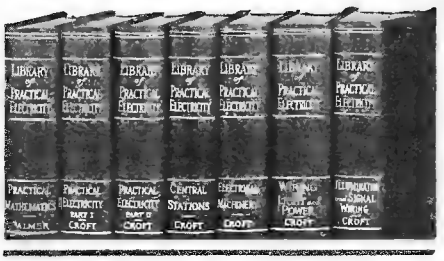
Thorough and practical Major Page's work is acceptable both to amateurs as well as those better acquainted in the field.

DETERMINATION OF ORBITS OF COMETS AND ASTEROIDS, by Russell Tracy Crawford, Professor of Astronomy, University of California. Published by McGraw-Hill Book Company, Inc., New York. 1930. Pages XI; 233. Price $4.00.

This book is a mass of mathematics and therefore will frighten many readers. 135 pages are devoted to descriptions of the methods used for the determinations treated of in the book. The author, starting out with a very interesting introduction, states that the discoveries of Newton are all sufficient for the investigations he describes. Newton's laws are so simple and so practical that it is a comfort to find that he can get on without Einstein and the fourth dimension. Kepler's laws are alluded to, so the very first page of the introduction is a tribute to the great men of the past centuries. The introduction takes less than five pages and makes very interesting reading. The text of the book starts in at once with differentials, attacking the subject at the start. In several places in the main text, examples are given, using concrete numbers, so as to show how the work is applied in practice. It is obvious that this is a most excellent feature and it gives one a great respect for astronomical computators to see how complicated their work becomes. The examples are the practical applications of the investigations described in the text. An appendix of 98 pages gives more examples, formulas and an extensive series of tables. The book hardly lends itself to an index, but a very satisfactory one is given.

VAUDEVILLE HYPNOTISM by David J. Lustig, published by La-Vellma's Workshop, New York City. 35 pages—paper cover pamphlet style. Price $2.00.

Speaking Confidentially is a very apt alternative name for Vaudeville Hypnotism. Doctor Lustig's book just breathes, oozes, and drips confidence. In his desire to detail those qualities which are the most important assets of



Go after the Big-Pay Job!

DON'T be satisfied to worry along in little jobs with little pay. Master the finer points of electrical practice and bring the big-pay job within your reach. The man who knows electricity in all its many phases—the man who has completely mastered the subject from A to Z—can pick his own job and name his own salary. Learn the way to bigger pay. Become an electrical expert. Croft will show you how. Through his famous books he will teach you electricity as experts know it and put you in line for an expert's pay. Fifty-nine thousand men are using these books to step ahead—WHY NOT YOU?

The Croft Library of Practical Electricity

A reference library and self-training course in seven volumes. 2785 pages—2045 illustrations

59,000 Croft Sets NOW IN USE

The Standard in Practical Electrical Training

The Croft Library is a complete electrical educator. It is founded on practice—on work as it is actually done. It is jammed from cover to cover with the kind of hard-headed facts you want. Written so that the beginner can easily understand it, yet so sound, so thorough, that it is the daily guide of 59,000 highly paid electrical workers and engineers.

Croft tells you the things you need to know about motors, generators, armatures, commutators, transformers, circuits, switchboards, distribution systems—electrical machinery of every type—wiring for light and power—wiring of finished buildings—underwriters and municipal requirements—illumination in its every phase—the latest and most improved methods of lighting—lamps and lighting effects, etc.—how to do a complete job, from estimating it, to completion.

Make no mistake about it—there are big jobs in electricity ready for you when you're ready for them. Thousands of men who have the Croft Library know that to be a fact. The Library itself, on a FREE TRIAL BASIS, will prove it to your own absolute satisfaction.

NO MONEY DOWN
Small Monthly Payments

10 Days FREE TRIAL Just Mail the Coupon

Fill in and mail the coupon attached and we will send you the entire set of seven volumes for ten days' Free Examination. We take all the risk—pay all charges. You assume no obligation—you pay nothing unless you decide to keep the books. Then $1.50 in ten days and the balance at the rate of $2.00 a month. Send the coupon NOW and see the books for yourself.

FREE EXAMINATION COUPON

McGraw-Hill Book Co., Inc.,
370 Seventh Ave., New York.

Send me for 10 days' free examination the Croft Library of Practical Electricity. If satisfactory, I will send you $1.50 in 10 days and $2.00 monthly until the special price of $19.50 is paid. If not wanted, I will return the books at your expense. (To insure prompt shipment write plainly and fill in all lines.)

Name .....

Address .....

City and State .....

Position .....

Company .....

SI—12-30

www.americanradiohistory.com

Get the NEW IDEAL EAGLET for Christmas!

Construction Set **50c** Postpaid

Finest little ship you ever saw—flies with the best of them! 20 in. wing-span, full-fuselage Cabin type. Made of Readi-cut Balsawood (not cardboard); built-up wings with cambered ribs; formed Balsa Propeller with nosing; wood wheels; finished metal parts. Demountable wing; weighs 1 oz. complete. Everything ready for construction. It's a beauty when attractively colored. Get yours now and have some fun.

There are lots of other IDEAL Model Airplanes, and if you are going to get one this Christmas send for

48-page Catalog and New Christmas Circular of Latest Models—5c

IDEAL AEROPLANE & SUPPLY COMPANY, INC.
22-24 West 19th Street, New York City

WHAT A THRILL!

All the locals and the world at your finger tips!!!

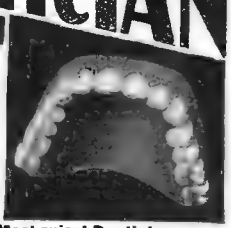
PILOT SUPER D. C. $29.50
WASP A. C. $34.50

For short wave and regular broadcast reception nothing equals this set that has made history in "round-the-world" communication. Shipped in kit form with full set of tubes and simple instructions for easy assembly. A. C. model, $34.50. Battery model, $29.50. Power Pack for A. C. set, $18.40, including Rectifier Tube. Other A. C. tubes, $9.90. Tubes for D. C. set, $8.25. Typical 20th Century values—where you get everything in radio at lowest prices. Send 25% deposit, balance C. O. D. plus transportation. Speaker extra. Power Pack extra.

SEND FOR CATALOG and FREE RADIO GIFT

20th CENTURY MAIL ORDER CORP.
204-B West Jackson, Chicago, Ill.

Be a DENTICIAN
LEARN AT HOME



To make Crowns, Plates, Bridgework, etc., for Dentists. Easy practical way to learn mechanical dentistry at home in spare time. Full equipment of tools and materials included with course FREE. Low tuition. Easy terms. Write for FREE BOOK about this money making profession and our easy-to-learn home study course and special offer.

McCarrie School of Mechanical Dentistry
1340 S. Michigan Avenue Dept. E-419 Chicago, Ill.

NEW FREE CATALOG DESIGNS
CLASS RINGS
RING AS SHOWN WITH ANY ONE OR TWO LETTERS IN CENTRE AND EITHER HS, JH, GS OR SS BESIDE SHIELD
STERLING SILVER
36 OR MORE | 24 TO 35 | 12 TO 23 | 1 TO 12
$1.35 EA | $1.50 EA | $1.75 EA | $2.00 EA
$1.35 EACH
STERLING SILVER 3 DOZ QUANTITY
2904
THE METAL ARTS CO 770 PORTLAND AVE., ROCHESTER N.Y.

AVIATION Information FREE

Send us your name and address for full information regarding the Aviation and Airplane business. Find out about the many great opportunities now open and how we prepare you at home, during spare time, to qualify. Our new book "Opportunities in the Airplane Industry" also sent free if you answer at once.

AMERICAN SCHOOL OF AVIATION
Dept. 1429 3601 Michigan Ave. CHICAGO

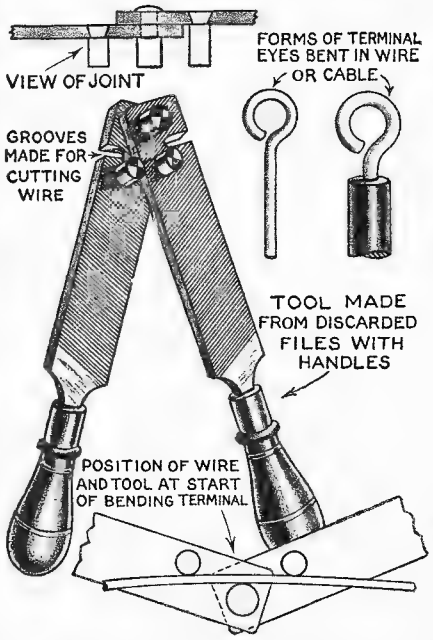
the successful showman, the author has subordinated every other valued characteristic and gift to confidence.

Vaudeville Hypnotism is a book from which not only the professional hypnotist and would-be Magi may derive benefit. Doctor Lustig very clearly points out that the patter and stage business which form a substantial part of the reading matter can be memorized and mastered by anyone. The same lines can be added to or subtracted from without materially affecting the result which can be expected from their use. That divine spark, that something which makes these words glow and endows them with life is the personality of the speaker, the confidence which he has in himself and his ability to make others feel that he is master of all he surveys.

Reviewed books can be secured from the publishers or directly from our Service Department.

Electric Terminals Bent With Simple Hand Tool

THE bending of eye terminals in bus bars, heavy electric wire or in any kind of wire, is quickly and effectively accomplished with the tool shown in


VIEW OF JOINT
FORMS OF TERMINAL EYES BENT IN WIRE OR CABLE
GROOVES MADE FOR CUTTING WIRE
TOOL MADE FROM DISCARDED FILES WITH HANDLES
POSITION OF WIRE AND TOOL AT START OF BENDING TERMINAL

the attached sketch. This tool is sketched after one devised by an electrician, which tool was made from two small discarded flat files. To make from files it is necessary to anneal the ends for drilling and cutting the shear slots shown. After cutting the material, it is heated and quenched to harden.

The method of using is to first open it up, so that the straight end of the wire can be inserted between the pins as shown at the bottom of the cut. The handles are then moved around, to form the eye. The reverse bend to bring the eye in its right position with reference to the wire is made by bending the wire backward, while holding the tool fixed. The use of the cutter will be clear to the user of the tool.—*G. A. Luers.*

NO MORE BIG TIRE BILLS!
GOODYEAR · FISK · Firestone · U.S. AND OTHER TIRES
At ¼ Regular Prices

Tires You Know and Prefer AT NEW LOW PRICES!

You can rely upon Chicago's oldest and most reliable rubber company to deliver tire mileage at lowest cost. Actual tests on the worst roads in the country prove that our standard brand, reconstructed tires deliver 50 to 60 per cent more service. A trial order will convince you.

BUY NOW 12 MONTHS' SERVICE GUARANTEED SAVE MONEY

BALLOON Tires Size	Rim	Tires	Tubes	Reg. CORD Tires Size	Tires	Tubes
29x4.40-21"		$2.30	$1.10	30x3	$2.20	$1.00
29x4.50-20"		2.40	1.15	30x3½	2.25	1.00
30x4.50-21"		2.45	1.20	32x3½	2.70	1.15
28x4.75-19"		2.45	1.20	31x4	2.95	1.15
30x4.95-21"		2.90	1.35	32x4	2.95	1.15
30x5.00-20"		2.95	1.35	33x4	2.95	1.15
28x5.25-18"		2.95	1.35	34x4	3.50	1.15
30x5.25-20"		2.95	1.35	32x4½	3.20	1.45
31x5.25-21"		3.20	1.35	33x4½	3.20	1.45
30x6.77-20"		3.20	1.40	34x4½	3.45	1.45
31x6.00-19"		3.20	1.40	30x5	3.60	1.75
32x6.00-20"		3.20	1.40	33x5	3.60	1.75
33x6.00-21"		3.20	1.45	35x5	4.45	1.75
32x6.20-20"		3.65	1.75	All Other Sizes		

DEALERS WANTED

All Tubes New—Guaranteed First Quality

Send only $1.00 deposit with each tire ordered, balance C. O. D. If you send cash in full deduct 5 per cent. You are guaranteed a year's service or replacement at half price.

MIDLAND TIRE & RUBBER COMPANY
Dept. 679 1000-10 W. Sixty-Third Street Chicago

WE MATCH PANTS To Any Suit!

Double the life of your coat and vest with correctly matched pants, **100,000 patterns.** Every pair hand tailored to your measure; no "readymades." Our match sent **FREE** for your O. K. before pants are made. Fit guaranteed. **Send piece of cloth or vest today.**

SUPERIOR MATCH PANTS COMPANY
115 So. Dearborn Street, Dept. 395 Chicago

How I Got Back my Hearing

By own, simple, inexpensive invention after being deaf 20 years, told FREE, to any deaf person who writes me. Geo. H. Wilson, Pres., WILSON EAR DRUM CO. 497 Todd Bldg., Louisville, Ky., U. S. A.

MODEL BLUEPRINTS

Correct—Easy to Follow

1-2	Horizontal Steam Engine details..set	$1.00
3-4	Boiler construction for above....set	1.00
5	880-Ton Bark	.50
6-7	Twin Cylinder Steam Engine and Boiler .....set	1.00
8-9	Gasoline Fired Locomotive.....set	2.00
10-11	U. S. S. Constitution, "Old Ironsides" .....set	1.00
12	13th Century Man-of-War	.50
13-14	Chinese Junk .....set	.50
15-16	Electrically Driven Automobile..set	1.00
17	Roman Ballista	.50
18-19	Simple Steam Engine .....set	.50
20-21	How to Build a Reflecting Telescope.	1.00
22	"Santa Maria," complete	.50
23-24	Model U. S. S. Portsmouth.....set	1.00
25	Building a Model Tugboat	.50
26	Twin Cylinder Marine Engine.....	.50
27-31	U. S. S. Truxton.....	2.00
32	Sopwith Biplane	.50
33	Speed Boat	.50
34	Airplane Engine	.50
35-36	Motor Winch	.75
37-38	Vertical Steam Engine.....	1.00
39	Cannon	.50
40	Steam Roller	.50
41	Prairie Schooner	.50
	Lincoln Sport Biplane (man-carrying)	6.75
	Gerber Monoplane (man-carrying)..	1.00

Anyone who can read blueprints and is at all handy with tools, will find no difficulty in following the simple explanatory diagrams. Many sport planes and monoplanes built from our plans are flying daily, thus attesting to the accuracy of the blueprint details. Satisfaction guaranteed.

Send Orders to

BLUEPRINT DEPARTMENT
SCIENCE AND INVENTION
381 FOURTH AVENUE
NEW YORK CITY

www.americanradiohistory.com

Compact Dressing Table

(*Continued from page* 718)

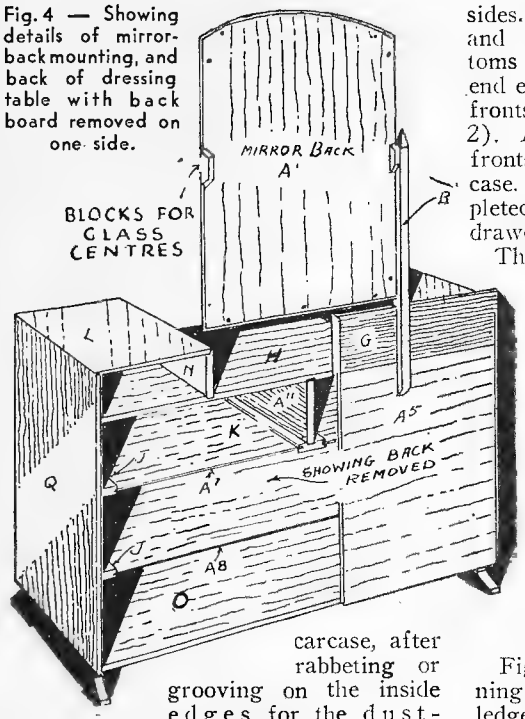


Fig. 4 — Showing details of mirror-back mounting, and back of dressing table with back board removed on one side.

carcase, after rabbeting or grooving on the inside edges for the dust-boards. A tongue ⅜ in. long is allowed on the runners to fit into the grooves in the drawer rails.

The centre runner (K) is grooved on the edges for the dust-boards. These runners are fitted to the carcase ends, using the slot-screw method without glue. The dust-boards can be slipped in from the back and left dry, and the drawer guides pinned to the end (Q at the front directly behind the end clamps (M).

The drawer construction presents the most difficult and laborious task. The work of dovetailing the drawers together might easily be accomplished through the medium of a local cabinet factory, where there are machines for high-speed dovetailing. The initial cost of this would amply repay the reader who has not the facilities for dovetail cutting, as well as giving a neater appearance when completed.

The drawer fronts will need grooving on their inner faces for the bottoms. The sides are allowed for ⅜-in. dovetails into the fronts, while the backs are through-dovetailed with the sides. Drawer slips might be glued and pinned to the sides, the bottoms being mulletted on the front and end edges to fit into the grooves in the fronts and slips respectively (see Fig. 2). A width of ⅛-in. is allowed on the fronts and sides for fitting to the carcase. The drawer fitting is finally completed by pinning small blocks on the drawer rails to serve as stops.

The carcase back, back rail (G) and standards (B) remain to be fitted. The back rail should be of nice quartered oak, and its only decoration consists of two circular facings, both ⅛-in. in thickness and applied on top of each other.

The intended wood for the under facing is white sycamore, while the top facing might be in ebony.

The facings, when polishing, should be finished their natural color with white shellac polish. Well glue these to the ledge for fixing, and stop any pin holes.

Fig. 4 shows the back rail (G,) running right through, serving as a back ledge. This will necessitate the mid-board (H) and wing tops (L) being notched away to enable the rail to stand flush at the back. A groove or rebate, ½ in. wide and ⅜ in. deep, will be needed on the bottom edge for the carcase back.

The mirror standards might next be moulded all round at the top to the section in Fig. 2, they are wider on the ends to allow for half-lapping over the back rail (G) at the bottom. These standards might also be forked over at the front as well as at back if desired, as in Fig. 1.

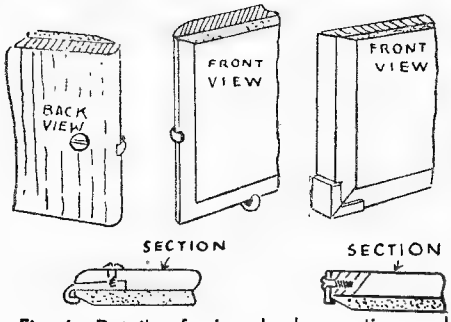


Fig. 6—Details of mirror-back mounting, and clips.

The mirror intended for this dressing table is frameless. A drawing might be made of it to sizes given in Fig. 1 and sent to the glass factor for manufacturing. It should be of ¼ in. plate glass and ordered with a ⅜ in. beveled and polished edge all around.

The mirror back might be of ⅜ in. birch plywood and should be shaped to the mirror and blocked as in Fig. 4. Its appearance is lightened if a small round is worked on the edges as in Fig. 6. This illustration also gives details of suitable metal clips, generally nickeled, for fixing the mirror to the wood back. These are the most popular of a various

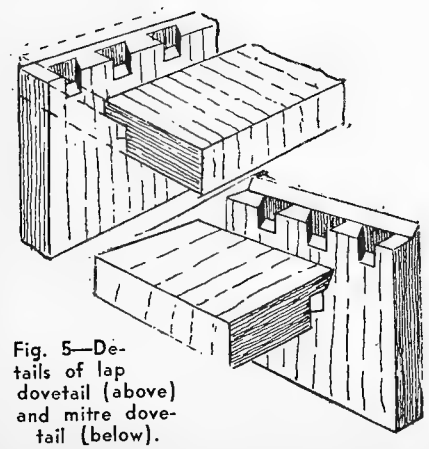


Fig. 5—Details of lap dovetail (above) and mitre dovetail (below).

if-

you pledge

yourself to secrecy we will teach you the secrets of

Real Professional

Magic

Dr. Harlan Tarbell, internationally known magician and teacher of some of the world's greatest magicians.

Learn to be a Magician

For the first time in the history of Magic the age-old, sacredly guarded secrets of the Mystic Art are being revealed. Now at last you can learn to be a Real Professional Magician. Yes, and you can learn this wonderful art *easily and quickly* AT HOME. You are taught the mysterious *Principles* by which the Professional Magician works. You are taught everything from wonderful impromptu effects to massive stage illusions. But before you can study, you must sign the Magician's Solemn Pledge of Secrecy. This means that you are getting the *guarded secrets* of the Magic Profession. Think of that!

Earn Big Money

There's a big demand for Magic entertainment. Magicians get big money. Dr. Tarbell gets as high as $250 for a half hour's work. Unlimited opportunities for you!

Write for Details!

No Salesman Will Bother You!

Mail coupon now for the free Magic literature telling all about the great Tarbell Course in Magic. Get our Low Prices and Easy Payment Plan. No salesman will ever call, bother or annoy you.

Tarbell System, Inc., Studio 14-29
1926 Sunnyside Ave., Chicago, Ill.

Tarbell System, Inc., Studio 14-29
1926 Sunnyside Avenue, Chicago, Ill.

Gentlemen: Without any obligation send me your free literature and information all about your wonderful "Tarbell Course in Magic." Also tell me about your Low Prices and Easy Payment Plan.

Name.....

Address.....

.....Age.....

www.americanradiohistory.com

START TO PLAY VERY FIRST DAY

Even if you can't read a note of music right now, you play a simple melody on the very day you get your Deagan Xylorimba. Free, easy lessons show you how. Soon you are amazing friends and relatives. Then a new life begins—long, happy evenings of joy; parties; popularity; radio engagements—and the same chance to make $5 to $25 a night as Ralph Smith, Chicago—"Played 20 minutes at wedding; received $20." Or the Hallmann family, Reading, Pa.,—"Made $300 in 5 weeks, spare time."

FIVE DAYS' FREE TRIAL—Our big FREE book tells all about this fascinating instrument—the 5-day free trial offer—the free lessons—the easy payment plan. Send in the coupon today—the booklet will be mailed promptly without cost or obligation.

MAIL COUPON TODAY!

J. C. Deagan, Inc., Dept. 3569, 1770 Berteau Ave., Chicago
Send me, without obligation, full details of Free Trial offer and easy-payment plan on the Deagan Xylorimba.

Name _____

Address _____

Send for Free Catalog

2000 illustrations — Diamonds, Watches and Jewelry — Largest Diamond and Watch Credit House in the World.

LOFTIS BROS. & CO.
Dept. G-22, 108 N. State St.
Chicago, Ill.

DRIVER HOME WORKSHOP

See it demonstrated at the following stores: W. T. Grant Co.—Sears, Roebuck & Co.—S. S. Kresge Co.—F. & W. Grand Co.—Schulte-United, Inc.—Neisner Bros.—J. J. Newberry Co.

Walker-Turner Co., Inc. Jersey City, N. J.

BURN YOUR NAME ON TOOLS
WITH THE
ARKOGRAF
Protect Your
Tools From Theft. Write with electricity any name or design on the hardest and finest tools, or any metal, like writing with a pen. Outfit $3.50 Prepaid Anywhere. Illustrated circular free. Write today. Agents wanted.
ARKOGRAF PEN CO.,
1171½ E. Stark St., Portland, Ore.

✓FREE BOOKS of BUSINESS HELPS

We publish over 200 Home Study Books, each a complete treatise of its subject. We have one or more for you. Books on

☐ Commercial Art
☐ Lettering
☐ Advertising
☐ Sign Making
☐ Radio
☐ Aviation
☐ Painting
☐ Silk Screen Process
☐ Decoration
☐ Automobiles
☐ Battery Work
☐ Electricity
☐ Carpentry
☐ Building
☐ Contracting
☐ Sheet Metal Work

and many other subjects. All fully described in our FREE CATALOG. Check the subjects in which you are interested and write today.

FREDERICK J. DRAKE & CO., Publishers
Room 510—179 No. Michigan Blvd., Chicago
Drake books are for sale in all book stores

assortment and are obtainable at any local hardware store. The jewel drawers might have locks and pull out with the key.

As a guide to finish, the blocks (or feet) are to be ebonized, together with the wood drawer knobs. The pyramid effect on the standards might also appeal if ebonized. The rest of the table might be treated with the blue oak finish.

Sundries. 1 B. S. P. 26 in. X 16 in., ⅜ in. bevel; 1 pair of glass centres; 8 nickeled clips for fixing glass; 2 till locks, ¾ in. to centre of pin with brass thread escutcheons; 4 1-in. domes of silence for blocks (A).

	Long Ft.	Ins.	Width Ins.	Thick Ins.
A 2 Blocks	1-	9	3	1½
B 2 Standards	2-	3	1½	1¼
C 2 Drawer Fronts	0-	8	3⅝	⅞
D 2 Drawer Fronts	1-	4⅞	5⅝	⅞
E 1 Drawer Front	2-	10½	6⅝	⅞
F 1 Drawer Front	2-	10½	7⅞	⅞
G 1 Back Rail	3-	0	6½	13/16
H 1 Mid Board	2-	11⅜	20¼	¾
I 2 Drawer Rails	2-	11⅜	2¼	¾
J 4 Drawer Runners	1-	7	1½	¾
K 1 Drawer Runner	1-	7	3	¾
L 2 Wing Tops	0-	9½	21	¾
M 2 End Clamps	2-	3	2¼	¾
N 2 Ends	0-	4¼	21	¾
O 1 Bottom	2-	11⅝	20¾	¾
P 2 Blocks	0-	3	1½	⅝
Q 2 Outer Ends	2-	3	19⅛	9/16
R 2 Drawer Muntins	1-	7¼	3	9/16
S 4 Drawer Sides	1-	7	3⅝	7/16
T 4 Drawer Sides	1-	7	5⅝	7/16
U 2 Drawer Sides	1-	7	6⅝	7/16
V 2 Drawer Sides	1-	7	7⅞	7/16
W 2 Drawer Backs	0-	8	2½	7/16
X 2 Drawer Backs	1-	4⅞	4¾	7/16
Y 1 Drawer Back	2-	10½	5¾	7/16
Z 1 Drawer Back	2-	10½	7	7/16
A1 1 Glass Back	2-	4	16	⅜
A2 2 Drawer Bottoms	0-	6⅞	19¼	5/16
A3 2 Drawer Bottoms	1-	3¾	19¼	5/16
A4 4 Drawer Bottoms	1-	3⅝	19¼	5/16
A5 1 Carcase Back	2-	11⅝	22⅜	⅜
A6 8 Drawer Guides	1-	0	1	¼
A7 2 Dust Boards	1-	3⅛	17	3/16
A8 1 Dust Board	2-	8¾	17	3/16
A9 1 Facing	0-	3¾	3¾	⅛
A10 1 Facing	0-	2½	2½	⅛
A11 1 Division	1-	6¾	5⅞	¾
A12 1 Division Clamp	0-	6¼	2¼	¾

Sizes are strictly net and allowance must be made for cutting, planing, etc.

Which Wood Shall I Use?

(*Continued from page 704*)

The same black locust grown in Sevier County, Tennessee, was strongest in the resistance of compression parallel to the grain, being 93% stronger than oak. And the above black willow, grown in Sauk County, Wisconsin, was the weakest in this respect, being only 37% as strong as oak. The locust is 4.95 times as strong as the willow in this comparison. Oak is used as the general basis of comparison in these tests because most people are familiar with oak and its excellent properties.

Osage Orange

Osage orange grown in Morgan County, Indiana, proved strongest in resisting compression perpendicular to the grain, being 211% stronger than oak.* The lowest figure was tied by two woods, namely, basswood grown in Marathon County, Wisconsin, which is only 27% as strong as oak and the same black willow twice mentioned above which is equally as weak. The strongest wood is 11.5 times as strong as the weakest.

As regards stiffness, blue gum grown in Alameda County, California, was the stiffest, being 53% stiffer than oak and again the same booby prize winning black willow, grown in Sauk County, Wisconsin, is least stiff, being only 37% as stiff as oak. The blue gum was 4.14 times as stiff as the willow.

The same osage orange grown in Morgan County; Indiana, is the hardest. That is, it is the most difficult to penetrate. It is 94% harder than oak. Three varieties of wood are tied as being softest, namely: The above mentioned basswood grown in Marathon County, Wisconsin; alpine fir grown in Grand County, Colorado, and Englemann spruce grown in San Miguel County, Colorado. These three woods are only 21% as hard as oak. The hardest wood is 9.25 times as hard as the softest.

When it comes to shock resisting the same osage orange mentioned above, grown in Morgan County, Indiana, has the greatest ability to resist shock, being 185% more resistive than oak. Western yellow pine grown in Madera County, California, is least able to resist shock, being only 32% as resistive as oak. The best has 8.9 times the resistance of the poorest.

In shearing strength, parallel to grain, honey locust grown in Hendricks County, Indiana, is the strongest, being 52% stronger than oak; while once more our old friend the black willow grown in Sauk County, Wisconsin, is the weakest in shearing strength, being only 43% as strong as oak. The best is 3.54 times as strong in this respect as the poorest.

It is evident that the osage orange grown in Morgan County, Indiana, is a very excellent wood, carrying away three of the first prizes: For maximum strength in compression perpendicular to the grain, maximum hardness, and maximum shock resisting ability. Black willow, grown in Sauk County, Wisconsin, is undoubtedly the poorest of all, being awarded five of the booby prizes, namely: Weakest in bending, weakest in compression parallel to the grain, weakest in compression perpendicular to the grain; weakest in stiffness; and weakest in resisting shear.

**With oak given a rating of 100, Osage orange would be rated 311.*

Heating Small Quantities of Water for the Laboratory

AN electric soldering iron will be found useful in heating small quantities of water, but the point must be on watertight to protect the heating element.—*Robert Huish.*

www.americanradiohistory.com

Will Grow Your Hair Or Cost Nothing

Before JACK SLAVIN At 45

After JACK SLAVIN At 65

You all know Jack Slavin, formerly Middleweight Champion Boxer of Australia and America. He's now 65, but when he was 45 he was bald. See untouched photos at sides. When he was touring Asia the Sultan of Jahore introduced him to a Hindu Prince who, in jest, attempted to pull the few straggling hairs that remained at his temples. Jack was angry, and to appease his anger the Prince handed him a formula, saying: "Here, this will grow your d..... hair." Imagine his delight when it DID.

He has used this formula and treatment for 14 years with success on thousands of bald heads.

It is guaranteed to grow hair on your head, stop falling hair, eliminate dandruff and relieve itching scalp, or your money will be refunded—every cent of it.

There is no need for you to suffer from baldness any more. Send NOW for **free information.** Sent in plain sealed wrapper without obligation.

Slavin Inst., Dept. 81, 508 S. Dearborn, Chicago, Ill.

RUPTURED

Comfort with Every Body Movement

basket ball players, athletes and sportsmen need the patented Brooks Appliance with automatic air cushion. A vast improvement in comfort and efficiency over old-style devices. Holds rupture without gouging discomfort. Allows full body freedom and still furnishes absolute protection. Test its comfort at work or play on 10 days' trial, and you'll throw away your old truss. Wear a light, clean, sanitary, made-to-measure Brooks Appliance. Over 3 million sold. Write for 28-page Rupture Booklet free. Sent in plain sealed envelope.

Brooks Appliance Co., 188-D State Street, Marshall, Mich.

RADIO BARGAINS

Low Power Transmitter adaptable for phone or code. With plug-in coils $14.75

Auto Radio—Uses 3—224, 2—227 tubes and 1—245 power tube, single dial, tremendous volume. Compact. Fits any car. We guarantee this set to perform better than sets selling up to $150.. 20.00

B Eliminator, Bone Dry with 280 tube, 180 volts, will operate up to ten tube set, fully guaranteed. 6.75

AC—A B C power packs 8.75

Tubes: UX type, 30-day replacement guarantee, No. 210, $2.25; No. 250, $2.35; No. 281, $1.85; No. 245, $1.25; No. 224, $1.25; No. 227, 75c; No. 226, 65c; No. 171, 75c.

CHAS. HOODWIN CO. 4240 Lincoln Ave. Dept. M-3, Chicago

DEAFNESS IS MISERY

Many people with defective hearing and Head Noises enjoy conversation, go to Theatre and Church because they use Leonard Invisible Ear Drums which resemble Tiny Megaphones fitting in the Ear entirely out of sight. No wires, batteries or head piece. They are inexpensive. Write for booklet and sworn statement of the inventor who was himself deaf.

DRUM

A. O. LEONARD, Inc., Suite 685, 70 5th Ave., New York

GOV'T POSITIONS

$35 TO $75 WEEKLY

MEN WOMEN

( ) Railway Mail Clerk
( ) P. O. Clerk
( ) P. O. Laborer
( ) File Clerk
( ) Matron
( ) General Clerk
( ) Chauffeur-Carrier
( ) Skilled Laborer
( ) Watchman
( ) Postmaster
( ) RFD Carrier
( ) Meat Inspector
( ) Special Agent (Customs Insp.)
( ) Steno-Typist
( ) Immigrant Insp.
( ) City Mail Carrier
( ) Border Patrol
( ) Typist
( ) Seamstress
( ) Steno-Secretary
( ) Auditor

AGE 18 TO 55

INSTRUCTION BUREAU, 383 St. Louis, Mo.

Send me particulars about positions marked "X"—salaries, locations, opportunities, "How to Qualify", etc.

Name.....

Address.....

What's New in Radio?

(*Continued from page 727*)

crackles and minimizes static without impairing the quality of reproduction. The perfection and introduction of quick-heater tubes has eliminated that annoying wait for the receiver to become operative after it is switched on.

Home-recording is a new feature of an R.C.A. Victor 8-tube combination radio receiver and electric phonograph.

Phonograph pick-ups have undergone still further improvement, and were displayed in large numbers. A large number of receivers this year are equipped with a jack into which the pick-up can be plugged, thus instantly transforming the radio set into a phonograph reproducer.

Screen grid tubes are practically universal this season, either three or four of them being incorporated in the R.F. stages. One or two improved superheterodynes employing screen grid tubes were also on display. It is claimed that these are more than four times as sensitive as the older models, and that many of the old faults of the superhet. have been eliminated.

Midget sets are very popular this season. These little sets are entirely self-contained and were displayed by over fifty manufacturers. They measure approximately fifteen inches square and eight inches deep, and are designed for use on the mantel shelf or other similar location. Small console sets, measuring only twenty-four inches in height, were also much in evidence. The flat tops of these sets come in very handy as small occasional tables.

One feature of the Seventh Annual Radio World's Fair remains unchanged—the radio sets are still silent. It is agreed that to operate all sets would involve a mass of aerials, and also a bedlam of noise. It is agreed also that there is but little difference between the present practice of inviting those interested to attend a demonstration at a near-by hotel and the practice, obviously necessary, of inviting visitors to automobile shows to make an appointment for an outside demonstration. But surely it is possible to demonstrate the quality of reproduction of the audio side of receivers by providing them all with the same input program, which could be supplied either from a central distributing station where phonograph records would be played, or by direct wire from the crystal studios. This practice has been followed very successfully during the past two years at the British radio show in London. In this way visitors are saved the great inconvenience and fatigue of trailing around a dozen hotels in the Times Square area—or going home without hearing anything of the abilities of the sets which they have seen. Also, it eliminates the necessity for setting up a public address system to provide incidental music for the entertainment of visitors. Granted, it provides no opportunity to demonstrate the sensitivity and selectivity of the R.F. side of the receiver, but it does go part way towards a solution of a real problem. What do our readers think?

If You Want a Job

or a Hobby

that Pays Well

Where You can be Your Own Boss

and Keep Your Own Hours

learn Illustrating

SEND for our free catalog, "A Road To Bigger Things." Learn how former Federal School graduates now earn good money. See the work and comments of fifty famous artists who contribute to the Federal Course in Illustrating.

Opportunities in drawing have never been better. The Federal Course includes illustrating, cartooning, lettering, window card illustrating, etc.

If you like to draw, train your talent. You may have art talent and not realize it. We enclose a test chart with our catalog. It tests your ability Free. Fill out the coupon now.

Federal School of Illustrating

Federal School of Illustrating,
12330 Federal Schools Building,
Minneapolis, Minnesota.

Name..... Age.....

Occupation .....

Address .....

www.americanradiohistory.com

"He whirled with incredible swiftness, and even as he whirled his gun seemed to jump into his hand."

The Riddle of Nugget Valley

IT isn't often that a sheriff looks for excitement. Particularly in an old-fashioned, rip-snorting, fast-shooting, western cow-town of the '80's, but handsome young Bob Drake found life rather boring, nevertheless, and just had to do something to stir up a little action.

In this complete, book-length novel of the days our grandfathers knew Bob gets what he craves, with a little too much action to suit even himself. For when a man joins a gang of bandits, and at the same time holds the office of sheriff in a hot little Nugget Valley town, he's bound to find himself in plenty of hot water.

So intensely gripping and well written is "The Riddle of Nugget Valley" that you'll wonder how we can turn out such great novels for only 25c. For that is all they cost—one complete book-length wild-west novel in "Complete Novel Magazine."

Ask your newsdealer today for "Complete Novel Magazine" and settle down to an inexpensive evening of the finest reading pleasure you've ever had. Here's hoping you can stand the excitement in "The Riddle of Nugget Valley."

Get It Today in the December

WILD WEST STORIES AND COMPLETE NOVEL

Magazine

ONLY 25c A COPY AT ALL NEWS-STANDS

Locating Gold

(*Continued from page 687*)

sound or shock waves varies and can be determined by seismic systems—a quake recorder is used to pick up any reflected or refracted waves caused by an explosion. The best prospecting methods to apply depend upon the geological structure of the region and the type of ore sought.

Recently, experts of the U. S. Bureau of Mines have been testing the efficiency of electrical systems of ore detection on Caribou Mountain in Colorado, a locality which has yielded more than $50,000,000 in subterranean wealth recovered as commercial gold, silver, copper, lead and tungsten. The geology of that region has been explored thoroughly, while it is ideally adapted to magnetic methods of geophysical prospecting. Hence there was a background of conclusive data for direct comparison with the results of the recent electrical surveys. This was the first time that such comparisons have been attempted, and the results demonstrated conclusively the reliability of the new methods of electrified prospecting.

Apparatus for Government Experiments

The simple and portable apparatus used in the latest Government experiments harnessed ordinary radio "B" batteries of 45 volts each as sources of direct current, while a U. S. Army signalling set, employed in communicating through the ground in wartime, provided alternating current when required. A frequency of 1300 cycles per second was found most satisfactory.

The electrified current was introduced into the ground by two electrodes, each comprising several stakes linked together with stranded copper wire and two parallel copper wires pegged to the ground every hundred feet. Ordinary angle iron stakes obtained from the army were more durable than the zinc-coated iron pipes with copper wires attached that were first used. The parallel bare copper wires were 600 feet long and were laid out along meridians 500 feet apart. Special reels designed for the purpose were used in the placing of this wire, while high resistance headphones were employed in keeping tab on the passage of the electric current through the soil.

The tests of radio reception through the ground which were successful up to distances of 550 feet were made with a home-made superheterodyne 9-tube radio set. The radio receiving set was placed in a shaft of the Caribou mine, 550 feet below the surface, and there picked up music broadcast from a neighboring city. These experiments tend to confirm the theory that radio waves pass through rock without much attenuation. Radio signals will penetrate sea water—a good conductor—to a depth of from 50 to 60 feet, which indicates that they would penetrate approximately ten times as far through a poor conductor like dry rock.

www.americanradiohistory.com

Why Television Images Split

(*Continued from page 702*)

mentally through the London station, I was associated with a series of observations and experiments which were made in Berlin on the reception of the London television signals. During night transmissions, between midnight and 12.30 a. m., double and triple images almost invariably appeared during some part of the transmission, but only during the worst periods of multiple image formation was there any marked alteration in the tone of the television signals as listened to by means of a loud speaker connected in parallel with the televisor.

For periods of three or four seconds the image would "fade over" into another image 10 to 20 picture elements higher, and this at times when the synchronism of the picture was perfect. Sometimes two images would be visible, one above the other, phase shifted by 180 degrees, i.e., a negative image. At other times the image would fade out entirely, leaving a blank screen.

The distance between London and Berlin, in a straight line, is about 800 miles. Using a sensitive receiver, London can be received in Berlin during the day, the receiver picking up energy principally from the ground wave. At night, due to the reinforcement provided by the less attenuated space wave, signals are, of course, very much stronger. The situation during night

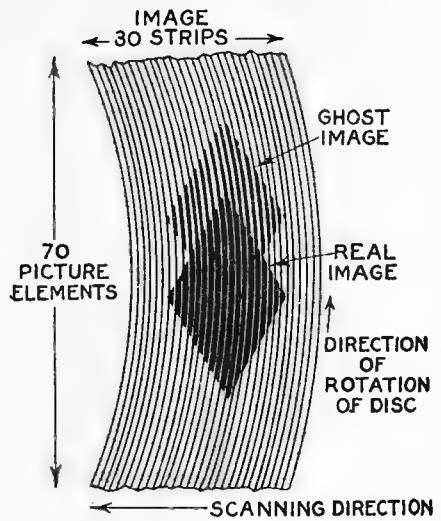


Fig. 4:—Main characteristics of Baird system image, showing position of ghost image.

reception may therefore be depicted as in Fig. 1, where the space wave, after being reflected down to earth again by the Heaviside Layer, arrives at Berlin in phase with the ground wave. If the two waves arrive at equal strength, there will be a slight echo effect detectable in sound broadcasting, and a double image effect in television broadcasting, due to the fact that, since the space wave has had to traverse a longer path, it will arrive a fraction of a second later. If one of the waves is very strong, and the other very weak, good unblemished reception of either sound or television will result.

In the case shown in Fig. 2, the space wave arrives 180° out of phase with the ground wave, and if the waves are of equal strength they will cancel one another out, and no signal will result at all. If one or other of the waves predominates, there will be a weak signal, the exact strength of which will depend upon the difference in strength of the two waves, and again the weaker wave will tend to produce an echo or double image effect, the weaker image in this case being negative.

Of course, the reflection of the space wave is not always so simple as I have illustrated it in Figs. 1 and 2. Multiple reflection from two or more places on the Heaviside Layer may take place, as shown in Fig. 3a; the wave may ricochet between the layer and the earth as shown in Fig. 3b, or it may be reflected from several places fairly close together, but causing the reflected waves to spread out over a wide area, as shown in Fig. 3c. All sorts of combinations of these three types of reflection are possible, and when one thinks about it in that light it is truly remarkable that we ever receive an intelligible signal at all over long distances.

Reverting to the London-Berlin experiments, it is possible to determine the delay in the time of arrival of the space wave responsible for the second, or ghost image, and from that figure we can attempt to calculate the height of the Heaviside Layer. But first it is necessary to explain some of the characteristics of the Baird system of television.

Unlike American experimenters, Baird uses vertical scanning instead of horizontal scanning. That is to say, his received image is formed on the side of the disc instead of at the top, and the image strips run vertically instead of horizontally. Instead of producing a square picture, he produces a rectangular one, the ratio of height to width being 7 to 3. He uses a 30-hole disc which scans the image from bottom to top, and from right to left, as shown in Fig. 4. The transmission speed is 12½ pictures per second.

With these explanatory details in mind, it is clear that if the second or ghost image is *above* the real image, the signals which gave rise to it occurred later in the scanning cycle. That is to say, the scanning disc had revolved slightly further round by the time the space wave signals arrived. It is taken for granted that it *is* the space wave which is responsible for the ghost image, for it has a longer path to travel than the ground wave (see Figs. 1 and 2).

Now, since the transmission speed is 12½ pictures per second, a single picture will take 0.08 second to transmit, and the transmission time for each image strip will be $0.08 \div 30 = 0.00266$ second. A vertical displacement of 10 picture elements is 1/7th the height of the image, or 1/7th the length of an image strip, so that the interval of time

(*Continued on page 763*)

U. S. GOVERNMENT STEADY JOBS

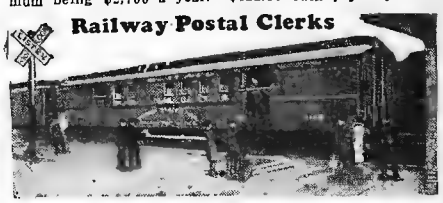
PICK YOUR JOB

Men — Women 18 to 50

These are steady positions. Strikes, poor business conditions, or politics will not affect them. Government employees get their pay for twelve full months every year.

$1,900 to $2,700 a Year

Railway Postal Clerks get $1,900 the first year, being paid on the first and fifteenth of each month. $79.17 each pay day. Their pay is quickly increased, the maximum being $2,700 a year. $112.50 each pay day.



Railway Postal Clerks, like all Government employees, have a yearly vacation of 15 working days (about 18 days). On runs, they usually work 3 days and have 3 days off duty or in the same proportion. During this off duty and vacation their pay continues just as though they were working. They travel on a pass when on business and see the country. When they grow old, they are retired with a pension. Spring examinations are expected.

CITY MAIL CARRIERS, POST OFFICE CLERKS

Clerks and Carriers now commence at $1,700 a year and automatically increase $100 a year to $2,100 and $2,300. They also have 15 days' paid vacation. City residence is unnecessary. Many February examinations expected.

GOVERNMENT CLERK—FILE CLERK

Salary $1,260 to $2,500 a year. Pleasant clerical and filing work in the various government departments at Washington, D. C., and other cities throughout the country.

IS YOUR JOB STEADY?

Compare these conditions with your present or your prospective condition, perhaps changing positions frequently, no chance in sight for PERMANENT employment; frequently out of a position and the year's average salary very low. DO YOU GET $1,900 EVERY YEAR? HAVE YOU ANY ASSURANCE THAT A FEW YEARS FROM NOW YOU WILL GET $2,100 to $2,700 A YEAR?

YOU CAN GET THEM

Experience is usually unnecessary, and political influence is not permitted. Let us show you how.

GET FREE LIST OF POSITIONS

Fill out the following coupon. Tear it off and mail it today—now, at once.

This investment of two cents for a postage stamp may result in your getting a Government Job.

FRANKLIN INSTITUTE
Dept. R-176, Rochester, N. Y.

Rush to me entirely free of charge (1) a full description of the position checked below; (2) Free Copy of 32-page book, "How to Get a Steady U. S. Government Job"; (3) A list of the U. S. Government Jobs now obtainable; (4) Tell me how to get a Government Job.

☐ Railway Postal Clerk ..... ($1,900-$2,700)
☐ Post Office Clerk ..... ($1,700-$2,300)
☐ City Mail Carrier ..... ($1,700-$2,100)
☐ Rural Mail Carrier ..... ($2,100-$3,300)
☐ Government Clerk—File Clerk ..... ($1,260-$2,500)
☐ Inspector of Customs ..... ($2,100 up)
☐ Prohibition Agent ..... ($2,300-$2,800)

Name .....

Address .....

Use This Coupon Before You Mislay It

www.americanradiohistory.com

RUPTURE IS NOT A TEAR

NO BREAK TO HEAL

Rupture is not a tear, but is due to a muscular weakness in the abdominal wall. Trusses merely brace these muscles but do not strengthen them—on the contrary, the gouging of the ordinary truss pad often increases this weakness as it tends to shut off circulation of the blood.

STUART'S ADHESIF PLAPAO-PADS are **patentably different**—being mechanico-chemico applicators—made self-adhesive purposely to keep the muscle-tonic called "Plapao" continuously applied to the affected parts, and to minimize danger of slipping and painful friction. The adhesive fabric is **soft as velvet** and clings to the body **without straps, buckles or springs. Easy to apply—comfortable—inexpensive.** Awarded Gold Medal, Rome, Grand Prix, Paris, Honorable Mention, Panama Pacific Exposition, San Francisco, etc. For almost a quarter century stacks of **sworn testimonials** from many different countries report success—**without delay from work.** The epidermatic absorption of Plapao utilizing "mechanico-chemico therapy" tends toward a natural process of recovery, **after which no further use for a truss.**

Stop wasting your time and money on old-fashioned devices. Learn how to close the hernial opening as nature intended, so **the rupture can't come down.** Send no money; just mail the Free Test coupon below. For your own good—write today—tomorrow may be too late.

FREE TEST COUPON
Plapao Laboratories, Inc.
686 Stuart Bldg., St. Louis, Mo.

Send me a Free 10 day test supply of the remedial factor Plapao and 48-page illustrated book on Rupture; no charge for this now or later.

Name.....

Address

Frank Facts
FREE to Men Past 40

A WELL KNOWN American scientist has discovered a new safe way to treat prostate gland failure. A wholly new method—a new drugless hygiene. 100,000 test cases. Endorsed by physicians. Often restores prostate gland to healthful activity in seven days. Unconditionally guaranteed. Write for scientist's FREE book, illustrated and copyrighted. No obligation. Address W. J. Kirk, 4536 Morris Ave., Steubenville, Ohio.

QUIT TOBACCO

Don't try to banish unaided the hold tobacco has upon you. Thousands of inveterate tobacco users have, with the aid of the Keeley Treatment, found it easy to quit.

KEELEY TREATMENT FOR TOBACCO HABIT Quickly banishes craving for tobacco. Successful for over 50 years. Write today for FREE BOOK and particulars of our MONEY-BACK GUARANTEE.

THE KEELEY INSTITUTE, Dept. L-510, Dwight, Ill.
Home of the famous Keeley Treatment for Liquor and Drugs. Booklet Sent on Request. Correspondence Strictly Confidential.

RAISE CHINCHILLA
AND NEW ZEALAND WHITE
FUR RABBITS
In Your Back Yard

We supply stock and a market for all you raise. 36-page illustrated book and catalog, also copy of FUR FARMING magazine tells how to raise rabbits successfully, all for 10 cents.

STAHL'S OUTDOOR ENTERPRISE CO., Inc.
1086 Outdoor Bldg., Holmes Park, Mo.

The Oracle

(*Continued from page 729*)

Proper proportions and correct types of aggregate and cement must be used.

The aggregates used for making porous concrete are pumice-stone, porous slag, or light cream colored brick, tile and pipe waste. These materials should be crushed to pass a quarter-inch mesh sieve and be retained on a No. 16 sieve. A coarse clean sand of the same grading as the foregoing aggregates may be used, but as extra care must be taken to grade it so that it does not make a really dense concrete and is uniformly porous, we do not recommend its use.

Portland cement or an aluminous cement may be used. The aluminous cement will produce a concrete that will come to full strength in a few days, while if Portland cement is used the concrete will require three to four weeks to cure.

The principle of operation which necessitates the use of porous concrete in the construction of an iceless refrigerator is simple. Water, which has been absorbed by the porous cement vessel evaporates and the heat necessary to produce evaporation is drawn from the interior of the box. In this way articles placed in an iceless refrigerator are kept cool.

Magic

(*Continued from page 721*)

The secret is simple. On his way back to the stage the magician looks at the time on one of the watches, let us say watch No. 1. He then picks up watch No. 2 from the tray and calls out the time indicated by the watch No. 1, which he secretly observed. Under pretext of determining whether he was correct, he looks at this watch, then picking up a third he reads the time he has again just observed on watch No. 2. It is the old principle of second playing card reading as applied to watches.

$5,000 FOR PERPETUAL MOTION

The editors have received thousands of different designs of perpetual motion devices, and have received hundreds of circular letters soliciting finances for the building of perpetual motion machines.

The editors know that if they receive these letters, there are thousands of others in this country who get similar letters and who fall for the claims made in the numerous prospectuses giving the earning capacities of the various machines.

Most of the shares of stock for these perpetual motion machines are being sold at a rate of **$1.00** per share, although some inventors are trying to sell shares of stock at **$100.00** per share.

Therefore, the editors of this publication say, "Just come in and show us—merely SHOW us—a working model of a perpetual motion machine and we will give you **$5,000.00.** But the machine must not be made to operate by tides, winds, waterpower, natural evaporation or humidity. It must be perpetual motion."

See the Craters in the MOON!

Astronomical and Terrestrial TELESCOPE Magnifies 30 Times

Own a genuine Astronomer's Telescope. See thousands of miles away. Make Sun, Moon Planets, Stars your next door neighbors. Moon Craters, Sun Spots, Eclipses, Comets enlarged 30 times. Strange thrills! Hours of fun looking at scenery, games, bathing beauties. Great for trips and voyages. Made like telescopes used in observatories. Gerding wrote, "Moon seemed 10 yards away."

Price Only $3.95

See Landscapes, Games, Ocean Scenes, Enlarged 30 Times!

Diameter 2 inches. Special friction adjustment for focusing. Adjustable bracket and clamp can be fastened to chair, fence, branch, etc. Finest materials. Will last a lifetime.

Five Days' Free Trial

Rush only $1.00 now. Pay balance ($2.95 plus postage), when postman delivers. Keep 5 days. If not delighted, return telescope and money will be refunded.

EARN $10 A DAY Charge 25c to look at the moon

ROLL O SPECIALTY CO., Dept. R-335
20 E. 3rd St., Cincinnati, O.

AN EASY WAY TO SHAPE your NOSE

Anita Nose Adjuster shapes flesh and cartilage — quickly, safely, painlessly, while you sleep. Lasting results. Gold Medal Winner. 78,000 users. Write for FREE BOOKLET.

30 DAYS HOME TRIAL

Anita Institute
1273 Anita Bldg., Newark, N. J.

STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, of Science and Invention Magazine, published monthly at Jamaica, N. Y., for October 1, 1930.

State of NEW YORK } ss.
County of NEW YORK }

Before me, a notary public in and for the State and County aforesaid, personally appeared J. T. Van Zile, who, having been duly sworn according to law, deposes and says that he is the President of Radio Science Publications, Inc., Publishers of Science and Invention, and that the following is, to the best of his knowledge and belief, a true statement of ownership, management, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24th, 1912, embodied in Section 411, Postal Laws and Regulations, to wit: 1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Radio-Science Publications, Inc., 381 Fourth Ave., New York City; Editor, Joseph H. Kraus, 381 Fourth Ave., New York City; Managing Editor, A. Dinsdale, 381 Fourth Ave., New York City; Business Managers, None. 2. That the owner is: Radio-Science Publications, Inc., 381 Fourth Ave., New York City; Mackinnon-Fly Publications, Inc., 381 Fourth Avenue, New York City; (Stockholders more than 1%—B. A. Mackinnon and H. K. Fly, both of 381 Fourth Avenue New York City). All stock allocated and pledged as security for loans. 3 That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: None. 4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him. 5. That the average number of copies of each issue of this publication sold or distributed through the mails or otherwise, to paid subscribers during the six months preceding the date shown above is (This information is required from daily publications only.) J. T. Van Zile, President of the Radio Science Publications, Incorporated. Sworn to and subscribed before me this 29th day of September, 1930. (Seal) Joseph H. Kraus, Notary Public, Queens County Clerk's No. 1003; Queens County Register's No. 6434; New York County Register's No. 1K252; New York County Clerk's No. 317. (My commission expires March 30, 1931.)

www.americanradiohistory.com

Ice Shuns Sweetened Wings

(*Continued from page 717*)

Anyone who has driven an automobile during bad weather with the temperature low and the air heavy with moisture knows how the ice forms on the windshield in solid form, hard and almost impossible to remove. Sometimes the ice is mixed with snow and sleet and then it is formed in ridges and is rough.

There are numerous temperature combinations of the air and rain which may produce ice on exposed surfaces, but the best known is when the air suddenly goes below the freezing point and rain is falling from comparatively warm clouds at a higher altitude. Under such conditions ice will surely form on any exposed thing that happens to be in the colder region. In the case of an airplane flying in such a region, ice forms and builds up rapidly on all leading edges. This ice gives a blunt nose, which soon breaks up the smooth air flow over the surfaces, thus reducing lift and increasing the drag and making an immediate landing necessary.

Clouds at One or Two Degrees Below Zero Centigrade

When ice piles up on the wing surfaces it may do it so quickly that the pilot has no time to rise above it or to land safely, and so the danger is great. Storms of this sort are quite common in the northern half of the United States and in Canada.

Another condition that brings about ice is when cloud or mist is found at an air temperature which is one or two degrees below freezing point. In this case the surface tension of the water particles is great enough to overcome the tendency to freeze. When the airplane runs into the cloud or mist, striking the tiny particles, they quickly freeze, giving a glaze formation similar to an ice storm, except that it is generally more moderate and does not deform the surface of the plane so quickly.

When running into icy mist a pilot may keep on going for a little time, perhaps never realizing his danger, while the ice is piling up and collecting on wings and wires. Suddenly he notices that there is a marked variation of his plane and a sluggishness of the controls, and he is having trouble in maintaining altitude. When that happens the danger is great, for it is too late to climb over the bad place because of the ice on the plane.

The third condition, which reports of air mail and transport fliers tell about, is encountered in fog or mist which is several degrees below freezing temperature. In such a condition the water particles are highly supercooled. As soon as the airplane comes in contact with these particles, they freeze upon the surfaces instantly and have the appearance of snow. It is not snow, but white, hard crystals of ice. These build out forward from all exposed leading edges, giving them a sharp-nosed shape.

The aviator has been unable to do more than "take a chance" on the temperatures which bring his dreaded foe, ice. Ambitious pilots have often tried different methods to see if the ice could be discouraged from forming. Others have gone in for instruments which would warn them when approaching dangerous regions of ice, but even such instruments do not help to get the plane and its load through on time.

A number of years ago a small wind tunnel was set up at McCook Field, near Dayton, Ohio, and connected with a refrigerated room for the purpose of studying the effect of ice on tubes. But this did not include the whole plan, and nothing that was satisfactory was discovered.

It was announced recently that Dr. W. C. Geer and Dr. Merit Scott of Cornell University had worked out a device known as an "overshoe," which could be laced over the leading edges of the wings. It is made of rubber, impregnated with a special oil. The idea is to reduce the adhesion between the ice and the rubber. Within the shoe are ducts of air to which a pulsating air pressure is applied. This alternately inflates and deflates the "overshoe," thus keeping the ice away.

This shoe method is very much as if an auto tire, running through icy weather, was being pumped up and let down so as to keep the ice from sticking to it.

The aviation engineers have concluded after a long series of tests using almost everything that could be suggested from soap and greases to sugar syrups, that there is nothing that can be applied that will absolutely prevent the ice from forming, if the weather is bad enough and long continued. Heavy greases, oils, waxes and paints did not stop the ice at all.

Streak Your Machine With Syrup!

It was found, however, that hard soluble compounds such as glucose and corn syrup, which hold their shape and adhere strongly to the surface of the wings, tended to keep the ice from forming if the temperature did not go too low.

Thus it may be possible that the aviator having to fly in the wintertime, when the weather is unstable, will find it necessary to see that his machine is streaked with corn syrup. He will wish to see it serviced by a good application of syrup along the edges to keep the ice away.

This study of weather is a notable one and will one day lead to the evolution of the perfect flying plane, able to come and go regardless of the whims of the gods of the upper air.

The trouble with the soluble compounds is that they will wash off rapidly in rain or heavy fog. Their action may be said to involve in a sense this property—their lack of permanency.

BOYS

(OF ALL AGES)

Build This Model Airplane FREE

Complete Materials and Instructions and Golden Wings Given Without Extra Charge with Your Subscription to

National Power GLIDER

Here you are, young fellow. This is the plane you will want to build. This Curtiss Falcon Model Mail Plane has established more records and won more contests than any other model plane. We are reserving a complete construction kit of this famous plane for you—that is if you act quickly. It is easy to build and guaranteed to fly. Working drawings and complete instructions accompany each kit and you may have it WITHOUT COST.

Join the ABA—Wear the Wings

Wear the gold wings signifying that you are a member of the Aviation Boosters of America, the most wide-awake aviation organization in the country. Your membership card and wings entitle you to all the privileges of this organization and are given free to all subscribers to the National Power Glider, the livest aviation magazine in the United States, edited by Lieut. E. Stieri and Major W. L. Purcell.

Every issue contains articles of interest written by aviation's outstanding authorities.

FREE Aviation in Home Study Course

Major William L. Purcell, a recognized authority on aviation, formerly Director of the Roosevelt Aviation School, is conducting in this magazine a complete home study course in aviation together with an instructive question and answer department.

Model Aircraft Department

A real model department with real workable and simple plans for the construction of flying and scale models, is conducted monthly in the national Power Glider, the Magazine of Practical Aviation, by Thomas L. Bulger, one of America's leading designers and builders of model aircraft.

MAIL THIS COUPON NOW

SEND NO MONEY

National Power Glider,
370 Seventh Avenue, New York, N. Y.

Send me the National Power Glider, the Magazine of Practical Aviation, for the next twelve months, and rush me my Curtiss Falcon Model Kit, my membership Card in the Aviation Boosters of America and my Golden Wings. I will pay the postman $1 50. ($2.00 in Canada) plus postage.

Name.....

Address.....

City..... State.....10

www.americanradiohistory.com

MOULDING A MIGHTY ARM

Get a 17 Inch Bicep

Complete Course on Arm Building

ONLY 25c

Get an arm of might with the power and grip to obey your physical desires. You can now build your arm from a scrawny piece of skin and bone to one of huge muscular size. I don't mean just a 17-inch bicep but a 15-inch forearm and an 8-inch wrist. This specially prepared course will build every muscle in the arm because it has been scientifically worked out for that purpose. You can develop a pair of triceps shaped like a horseshoe and just as strong, and a pair of biceps that will show their double head formation. The sinewy cable between the biceps and elbow will be deep and thick with wire cable ligaments. In that arm of yours, the forearm will belly with bulk, and the great supinator lifting muscle you can make into a column of power, while your wrist will grow alive and writhe with cordy sinew. All this you can get for 25 cents—send for this course today and you can have a he-man's arm built to be as beautiful, brawny and magnificent as the village blacksmith's.

You can't make a mistake. The guarantee of the strongest armed man in the world stands behind this course. I give you all the secrets of strength illustrated and explained as you like it. Build for yourself an unbreakable grip of steel and a Herculean arm. Mail your order now while you can still get this course at my introductory price of only 25c.

RUSH THE COUPON TODAY

To each purchaser will be given a FREE COPY of *THE THRILL OF BEING STRONG.* It is a priceless book to the strength fan and muscle builder. Full of pictures of marvelous bodied men who tell you decisively how you can build symmetry and strength the equal of theirs.

REACH OUT---GRASP THIS SPECIAL OFFER

Jowett Institute of Physical Culture
422 Poplar Street, Dept. 30M, Scranton, Penna.

Dear Mr. Jowett: I am enclosing 25c. Please send me the course "MOULDING A MIGHTY ARM" and a free copy of "THE THRILL OF BEING STRONG."

*Name*_____

*Address*_____

CAMERA MEN EARN BIG MONEY

Big Pay—Fascinating Work!

TREMENDOUS demand for trained camera men in studios, news films, educational and industrial fields. One of these enjoyable, well-paid positions, with unlimited future, can easily be yours!

Now You Can Quickly Qualify

In your spare time, our Simplified Plan prepares you for a well-paid position in an amazingly short time. SEND FOR FREE BOOK which tells how you can win big pay and fascinating work in this uncrowded field as:

☐ Motion Picturecamera Man or ☐ Projectionist
☐ "Still" Photographer or ☐ Photo-Finisher

New York Institute of Photography
Dept. V-1816, 10 West 33rd St., New York City

INDEX TO ADVERTISERS

A

Allied Radio Corp. 681
American School of Aviation 756
American School of Photography 750
Anita Institute 762
Arkograph Pen 758

B

Bastian Bros. Co. 742
Batenburg, P. J. F., Co. 752
Bernard & Heller 732
Bierbower, C. F. 767
Bliss Electrical School 743
Bodec Institute 746
Bogue, Benjamin N. 767
Brooks Appliance Co. 759

C

Casein Mfg. Co. of America, Inc. 740
Centre Publishing Co. 750
Chicago Gear Works 750
Classified Advertising 764
Coleman, Watson E. 734
Columbia School 738
Coyne Electrical School 677

D

D. C. Air Legion 739
Dayton School of Aviation 744
Deagan, J. C., Inc. 758
Delta Specialty Company 741
Detroit School of Lettering 750
Dobe, Engineer 743
Drake, Frederick J., & Co. 758
Dryer, Prof. J. A. 752

E

Encyclopedia Britannica, Inc. 679
Ethyl Gasoline 684
Evans, Victor J., & Co. 735

F

Federal School of Illustrating 759
First Hawaiian Conservatory of Music 742
Fisher, Adam, Mfg. Co. 732
Flood, John M., Machine Co. 734
Franklin Institute 743-761

G

Gaston Mfg. Co. 752
Gerstner, H., & Sons 744
Gilbert, A. C., Co. 737-745
Greene, W. T. 732

H

Heston & Anderson 746
High Frequency Laboratories .... Inside Front Cover
Historical Coach Models, Inc. 739
Hoodwin, Chas., Co. 750-759

I

Ideal Aeroplane & Supply Co. 756
Institute of Applied Science 763
Instruction Bureau 759
International Typewriter Exchange 748
Inventors Finance Corp. 734

J

Jowett Institute of Physical Culture 766

K

Keeley Institute 762
Kelsey Company 746
Kester Solder Co., Inc. 736
Kirk, W. J. 762

L

Lacey & Lacey 732
Laco Oil Burner Co. 751
Lancaster, Allwine & Rommel 734
LaSalle Extension University 750-767
Leonard, A. O. 759
Lincoln Airplane & Flying School 750
Loftis Bros. & Co. 758

M

McCarrie School of Mechanical Dentistry 756
McGraw-Hill Book Co., Inc. 755
Macfadden Book Co., Inc. 680
Marvel Mfg. Co. 750
Metal Arts Co. 756
Metal Cast Products 736
Middleton, John 736
Midland Tire & Rubber Co. 756
Miller & Miller 734
Miniature Ship Models, Inc. 746
Muscle Power Company 748

N

National Electrical School 738
National Power Glider 765
National Radio Institute 673
National State & Local Tuberculosis Associations of the U. S. 747
Newcomer Associates 748
New Method Mfg. Co. 747-752
New York Electrical School 739
New York Institute of Photography 766
Northwestern School of Taxidermy 748

O

O'Brien, Clarence A. 733

P

Pacific Coast Prod. Co., Ltd. 744
Pan American Band Instrument and Case Co. 738
Paramount Mfg. Co. 746
Polachek, Z. H. 732
Plapao Co. 762
Porter Chemical Co. 753
Postal Products Co., Inc. 749

R

R. C. A. Institute 731
Radex Press 743
Radio International Guild 744
Radio & Television Institute 675
Randolph & Co. 732
Roll-O Specialty Co. 762

S

Sanitube Co. 741
Schiercke, H. C. 738
Slavin Institute 759
Smith Typewriter Sales Corp. .... Inside Back Cover
Spors Importing Co. 739
Stahl's Outdoor Enterprise Co. 762
Strongfort Institute 742
Studebaker Corp. of America, The 683
Superior Match Pants 756

T

Tamblyn, F. W. 742
Tarbell System, Inc. 757
Teleplex Co. 734
Thaxley, D., Co. 747
Twentieth Century Mail Order Corp. 756

W

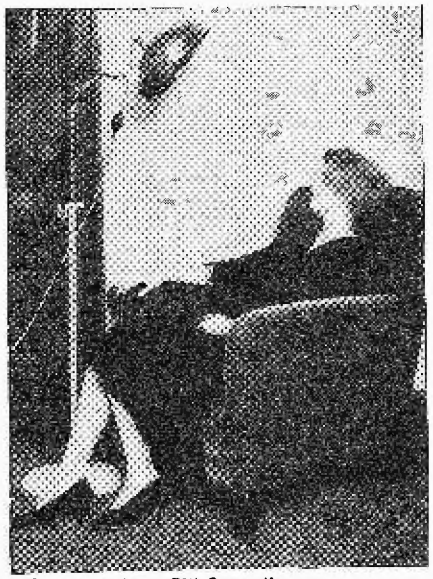
Waco Tool Works, Inc. 747
Wagner, George Steve 752
Walker Turner Co., Inc. 758
Whirlwind Co. .... Back Cover
Wilson Ear Drum Co. 756

(While every precaution is taken to insure accuracy, we cannot guarantee against the possibility of an occasional change or omission in the preparation of this index.)

www.americanradiohistory.com

Therapeutic Heat

THE invisible infra-red rays which, under the directions of a physician, can be safely used wherever heat relieves pain, are provided in the Anderson-Pitt Juven-Ray "lamp," for home



Courtesy Anderson-Pitt Corporation

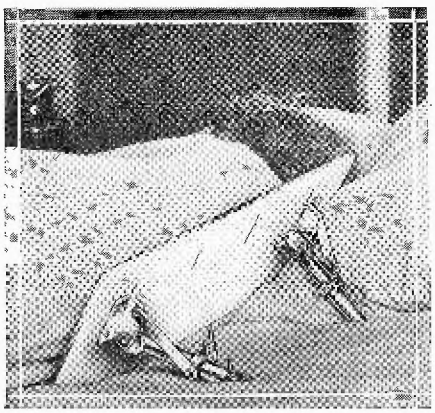
use. Sturdily constructed the lamp can be operated by anyone able to turn on an electric switch. Prolonged use is in no way harmful but may prove uncomfortable to the patient because of excessive heat. The lamp which can be adjusted to any angle may be used for sinus trouble, colds, sprains, or as a hot dry bath to stimulate the circulatory system. It can be employed by the woman of the house for drying her hair and for drying the baby after its bath. The radiations are free from ultra-violet rays, so no "sun-tan" effect will follow its use.

For the Sick Bed

A COMBINATION foot and back rest, adjustable for use in supporting other parts of the body, has been introduced under the name of the du Moulin foot rest.

The contrivance consists of a light weight adjustable aluminum plate which can be fastened by swiveled arms to the foot of the bed. These arms may be raised or lowered to any angle horizontally and vertically, so that the rest can be used to support head, neck, shoulders, feet, back, or thigh. Adjustment to the bed is by clinch-buckle straps which do not scratch or otherwise mar its surface. The device will also serve to steady the plate of the X-ray table.

It can be used above or under the bed clothes. When not in use, the rest can hang at the foot of the bed.



Courtesy du Moulin Foot Rest Company

SCIENCE AND INVENTION'S Service to Home Owners and Prospective Home Owners

NOTE TO READERS AND MANUFACTURERS

Whether your interest lies in materials and equipment for building a new home, for modernizing your present one, or getting new utensils for it, you will find the following list of subjects very helpful; for each subject we have several booklets. These are not just catalogues. Many contain full data on installing and using the products described. SCIENCE AND INVENTION provides them as a service to readers and will add to them from month to month as new booklets are received. To obtain booklets on any subject or subjects listed below, simply use the coupon at the foot of the list, and order by number of subject.

So as to make this list as complete as possible, SCIENCE AND INVENTION invites manufacturers to submit copies of their booklets or other literature. No obligation is involved. Simply address the materials to SCIENCE AND INVENTION, 381 Fourth Avenue, New York City, with a brief note authorizing inclusion of your booklets in future lists.

1 INSULATION
2 INCINERATORS
3 ROOFING AND SHINGLES
4 FURNITURE
5 SURFACE MATERIALS AND FINISHES
6 HARDWARE
7 PLUMBING
8 BATHROOMS AND BATHROOM ACCESSORIES
9 LUMBER
10 HEATING AND VENTILATING
11 WINDOWS, SCREENS, DOORS
12 HOME BUILDING MATERIALS
13 ELECTRIC WIRING, UTENSILS AND APPLIANCES

(Because of the demand for booklets covering this field, we have classified them as follows:)

Cooking Utensils
Fixtures and Outlets
Vacuum Cleaners and Floor Waxers
Dishwashers
Refrigerators
Portable Light and Power Plants
Clothes Washers, including Portables
Ironing and Drying Equipment
Fans
Telephone Accessories
Aids to Health
Soldering Irons

If you are interested in any of these articles under item number 13, write us, designating which ones, and we shall see that you are supplied with literature on the subject.

SCIENCE AND INVENTION
381 Fourth Avenue
New York, N. Y.

Gentlemen:
Please send me booklets

No. .....
Name .....
Address .....
.....

Increase Your Pay

Are you sacrificing the best years of your life to a routine job, in the thought that you can advance only at the shuffling pace of the rank and file?

Thousands of men with no better start than you have doubled and tripled their incomes by home-study business training under the LaSalle Problem Method. During a period of only six months, 1,248 members of LaSalle Extension University reported definite salary-increases as a result of training under this remarkable method. ***The average increase per man was 89 per cent.***

Send for This Book—It's Free

If "half as much again" would look good to you, check the training that interests you, sign and mail the coupon NOW. It will bring you full particulars, together with details of our ***convenient-payment plan;*** also your free copy of "Ten Years' Promotion in One." "Get this book," said a prominent Chicago executive, "even if you have to pay five dollars for it." We will send it ***free.***

Make your start toward that bigger job TODAY.

— — Find Yourself Through LaSalle! — —

LaSalle Extension University

The World's Largest Business Training Institution

Dept. 12384-R Chicago

Gentlemen: Send without obligation to me information regarding course indicated below:

☐Business Management ☐Commercial Law
☐Modern Salesmanship ☐Modern Business Correspondence
☐Higher Accountancy
☐Traffic Management ☐Expert Bookkeeping
☐Railway Station Mgmt ☐C. P. A. Coaching
☐Railway Accounting ☐Business English
☐Law: Degree of LL. B. ☐Commercial Spanish
☐Modern Foremanship ☐Effective Speaking
☐Personnel Management ☐Stenotypy-Stenography
☐Industrial Management ☐Telegraphy
☐Banking and Finance ☐Credit and Collection Correspondence
☐Paper Salesman's Training

Name .....
Present Position .....
Address .....

"STAMMERING Its Cause and Cure"

You can be quickly cured if you stammer. Send 10 cents, coin or stamps, for 288 page cloth bound book on Stammering and Stuttering. It tells how I cured myself after Stammering and Stuttering for 20 years.

BENJAMIN N. BOGUE
1296I Bogue Building, 1147 N. Illinois St., Indianapolis

A CLIPPER SHIP for $4.50

We supply all the necessary parts, cut and numbered, ready to put together. Instructions show full details how each numbered part fits into another. You can't go wrong. A few hours of pleasant pastime and you have a beautiful ship model. We also supply parts for the Santa Maria, the La Pinta and the Mayflower for $4.50. Constitution (Old Ironsides), $5.98. Also **COACH MODELS** (shown in our new catalogue) and **MINIATURE GOLF SETS** in knockdown form (shown in our new catalogue). All models sent C. O. D. plus a few cents postage. Foreign orders must be accompanied by check or money order.

C. J. BIERBOWER, Dept. SI
3216 Baring Street Philadelphia, Pa.
Originator of Build-Your-Own-Ship Model

C. J. Bierbower, Dept. SI
3216 Baring Street, Philadelphia, Pa.

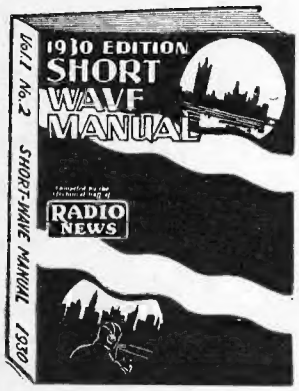
Please send me complete parts, cut to fit and ready to put together for the following: Clipper ship ☐; Constitution ☐; Santa Maria ☐; La Pinta ☐; Mayflower ☐; Coach model ☐; Miniature Golf Set ☐. Please send me information pertaining to .....

Name .....
Address .....
City ..... State .....

www.americanradiohistory.com

NEW BOOKS at Magazine Prices!

Each of the following 50c books is of the large size, 8½ x 11½ inches, containing 96 profusely illustrated pages, bound in beautiful colored covers. The contents of any one of them is equivalent to the average 300-page volume, and in ordinary book form would probably cost you from $2.00 to $10.00. Get these exceptional bargains TODAY, *while we still have them in stock!*



NEW RADIO TROUBLE FINDER & SERVICE MANUAL

Ever have your radio reception fail or become distorted just when a big program was on and you wanted to hear every delicate inflection of tone distinctly? That's when this big book is worth its weight in gold. In simple words and easy to understand charts and pictures, it shows you how to find and correct any radio trouble *quickly*. It's just the book you need for improving the reception of your set, repairing sets for friends, and for starting a profitable repair business of your own. Shipped, prepaid, to your home for only **50c**

HOW TO WIN AT BRIDGE

by Wilbur C. Whitehead

The world-famous Bridge authority's newest book. His easy picture method shows how to play both Auction and Contract Bridge TO WIN! Complete rules of play and methods of scoring for both Auction and Contract Bridge. Contains 500 hands to bid and play, with complete solutions and analyses in back of book. The biggest 50c worth ever offered to Bridge fans. Printed in 2 colors. Hearts and diamonds shown in red throughout. 96 pages. Large 8½ x 11½-inch size. Beautiful colored cover. Price postpaid, only... **50c**

LUCKY BREAKS

Read about the $315,000 fortune waiting for some Lucky person! Read what Belasco, Copeland, Untermyer, Taft and others think of Luck. Read about Luck in the movies, in athletics, above the clouds! Read about the Luck of the real person who actually did break the bank at Monte Carlo. Read about the Luck of Columbus, Napoleon, Lafayette. The Luck that made Presidents. Read these true stories of amazing Lucky Breaks and be prepared when yours comes along. Price, prepaid, only..... **50c**

FLYING FOR EVERYBODY

19 Chapters—More than 120 Photographs, Maps and Diagrams. This book is the one complete Aviation Manual which covers every phase of flying from the ground up. Condensed in its pages is the essence of years of experiences of Aviation's foremost authorities. No air-minded person should be without it. Price, prepaid, only **50c**

POPULAR MAGIC AND CARD TRICKS

Mystify your friends; charm the ladies; be the life of any party. Make glass bowls vanish, cards fly, coins disappear. Do hundreds of other magic tricks and games as easily as a professional. Over 200 described and illustrated in this big book on magic. Prepaid, only..... **50c**

NEW SHORT WAVE MANUAL

Experience the thrills of the Short Waves of hearing Europe, Africa or Australia direct as clearly as native stations. This big book, replete with illustrations and How-to-Build diagrams and plans, crowded with 28 chapters by Lieut. Wenstrom, Marshall, Spangenberg and other foremost S-W authorities, represents the last word in authentic S-W data. The most complete up-to-the-minute short wave manual ever published. Brings you more information than books selling at ten times its price. Shipped, prepaid to your home for only..... **50c**

RADIO AMATEURS' HANDIBOOK

Sometimes called the Radio Amateurs' Bible. 30 profusely illustrated chapters bring you 10 How-to-Build articles, with complete instructions and diagrams; new radio wrinkles, DX hints, data on the new tubes, answers to AC problems, and helpful, money-saving ideas for the radio service man. 96 illustrated pages. Large 8½ x 11½-inch size. Beautiful colored cover. Shipped, prepaid, to your home for only..... **50c**

1001 RADIO QUESTIONS AND ANSWERS

If you own a radio, you need this book. Everything you want to know about radio is in it, from "How to Kill Outside Radio Noises," to a clear description of the newest tubes and how to use them. If you have a question on radio, here is your answer and a thousand more. 96 illustrated pages. Large 8½ x 11½-inch size. Beautiful colored cover. Shipped, prepaid to your home for only **50c**

ANATOMICAL MANIKINS MALE & FEMALE

By Dr. David H. Keller

Book measures 6 x 14 inches. Contains 12 large plates of the human body, male and female, with complete descriptions of every muscle, nerve, gland, bone, organ, etc., including reproductive organs of male and female. Books of this kind ordinarily cost from $10 to $25 when bought through medical supply establishments. Price, complete and prepaid, only. **$1**

Also the Following at Only 25c Each

How to Make It (working in wood, metal, cement, paint, etc.)
How to Electrify Your Radio Set
What Radio Set Shall I Buy
How to Build the Famous One Knob Set
101 Radio Hook-Ups
The Neutrodyne and All About It
Cookoo Nuts (A game in book form for parties)
S'matter Pop (the famous comics in book form)

MAIL TODAY

RADIO-SCIENCE PUBLICATIONS, Inc.
Dept. 2512, 381 Fourth Ave., New York, N. Y.

Gentlemen: Please ship me, prepaid, the books whose titles I have listed below. Remittance is enclosed.

.....
.....
.....
.....

Name.....
Address.....
City.....
State.....

Buy Them at Your Newsdealer or Mail Coupon AT ONCE!

www.americanradiohistory.com

Only

$2.00 down

BRAND NEW

CORONA GENUINE *Model #3*

Lowest Price—Easiest Terms Ever Offered

HERE'S your chance to own that *brand new* Genuine Model 3 Corona you've wanted—on the easiest terms ever offered—at the LOWEST PRICE ever offered. Complete in every detail; back spacer, etc. *Manufacturer's Guarantee.* Recognized the world over as the **finest, strongest, sturdiest portable built.**

S. Joveton writes: "It truly is a wonderful machine. I am very pleased with it and find it very simple to work although it is the first typewriter I have ever used."

Don P. Fina, composer and pianist says: "Corona has helped me put my songs over and is still doing it. I find it just the thing for writing words to songs and for all correspondence to the profession."

F. J. Barsuglia, Jr., writes: "I am very well pleased with your little Corona and I must say I do not know what I would really do without it. It works like a charm and has every convenience of a larger machine."

Mrs. G. Bernstein says: "Allow me to thank you for prompt delivery of the Corona. I am delighted with it and know I shall derive great pleasure from its possession."

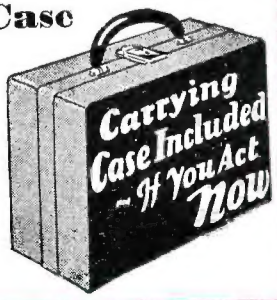
Yours for 10 DAYS FREE

Try this wonderful portable typewriter—the same machine that has satisfied 500,000 users. Experience the joy this personal writing portable typewriter can give you! Use it ten days free! See how easy it is to run and the splendidly typed letters it turns out. Ideal for the office, desk, home, traveling. Small, compact, light, convenient. Don't send out letters, manuscripts, reports, bills in poor handwriting when you can have this Corona at such a low price on such easy terms. Remember, these are *brand new* machines right out of the Corona factory.

Carrying Case INCLUDED

If you act Now!

Leatheroid carrying case, oiler, instructions free on this offer. Send no money—just the coupon. Without delay or red tape we will send you the Corona. Try it 10 days. If you decide to keep it, send us only $2—then $3 a month until our special price of $39.90 is paid. Now is the time to buy. Mail coupon today!



Save Money—Use This Coupon

Smith Typewriter Sales Corp.
[Corona Division]
469 E. Ohio St., Chicago, Dept. C-120

Ship me the Corona, F. O. B. Chicago. On arrival I'll deposit $2 with express agent. If I keep machine I'll send you $3 a month until the $37.90 balance of $39.90 price is paid, the title to remain with you until then. I am to have 10 days to try the typewriter. If I decide not to keep it, I will repack and return to express agent and get my money back. You are to give your standard guarantee.

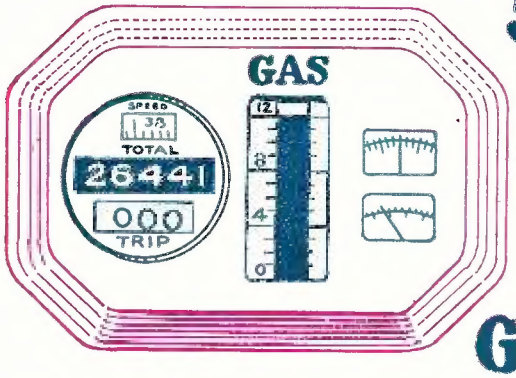
Name _____

Address _____

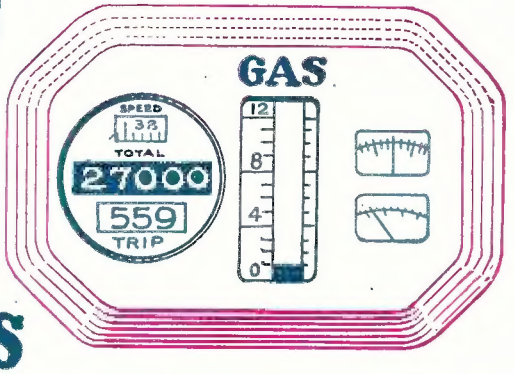
Employed by _____

www.americanradiohistory.com

Over the Mountains from Los Angeles



559 Miles on 11 Gallons of GAS



Think of it! FIVE HUNDRED FIFTY-NINE MILES over rough mountainous country burning only ELEVEN GALLONS OF GASOLINE. Imagine more than FIFTY MILES to the GALLON. This is what the WHIRLWIND CARBURETING DEVICE does for D. R. Gilbert, enough of a saving on just one trip to more than pay the cost of the Whirlwind.

THE WHIRLWIND SAVES MOTORISTS MILLIONS OF DOLLARS YEARLY

Whirlwind users, reporting the results of their tests, are amazed at the results they are getting. Letters keep streaming into the office telling of mileages all the way from 22 to 59 miles on a gallon, resulting in a saving of from 25 to 50% in gas bills alone.

Mark H. Estes writes: "I was making 17 miles to the gallon on my Pontiac Coupe. Today, with the Whirlwind, I am making 35 5/10 miles to the gallon. Am I glad I put it on? I'll say so!"

P. P. Goerzen writes: "I made an actual test both with and without a Whirlwind, getting 13½ miles without and 34 6/10 miles with the Whirlwind, or a gain of 21 miles to the gallon. The longer the Whirlwind is in use on the machine, the better the engine runs, has more pep and quicker starting. It makes a new engine out of an old one, and starts at the touch of the starter button."

R. J. Tulp: "The Whirlwind increased the mileage on our Ford truck from 12 to 26 miles to gallon and 25% in speed. We placed another on a Willy's Knight, and increased from 12 to 17 miles per gallon.

Arthur Grant: "I have an Oakland touring car that has been giving me 15 miles to the gallon average, but I can see a great difference with the Whirlwind, as it climbs the big hills on high and gives me better than 23 miles to the gallon of gas, which is better than 50% saving in gas."

W. A. Scott: "I had my Whirlwind for three years. Winter and summer it gives the same perfect service, instant starting, smoother running, and what I saved in gasoline these last few years has brought other luxuries which I could not have afforded previously."

Car owners all over the world are saving money every day with the Whirlwind, besides having better operating motors. Think what this means on your own car. Figure up your savings—enough for a radio—a bank account—added pleasures. Why let the Oil Companies profit by your waste. Find out about this amazing little device that will pay for itself every few weeks in gas saving alone.

FITS ALL CARS

In just a few minutes the Whirlwind can be installed on any make of car, truck, or tractor. It's actually less work than changing your oil, or putting water in the battery. No drilling, tapping or changes of any kind necessary. It is guaranteed to work perfectly on any make of car, truck or tractor, large or small, new model or old model. The more you drive the more you will save.

SALESMEN AND DISTRIBUTORS WANTED

To Make Up to $100.00 a Week and More

Whirlwind men are making big profits supplying this fast-selling device that car owners cannot afford to be without. Good territory is still open. Free sample offer to workers. Full particulars sent on request. Just check the coupon.

WHIRLWIND MANUFACTURING CO.
999-401-A Third Street Milwaukee, Wisc.

GUARANTEE

No matter what kind of a car you have—no matter how big a gas eater it is—the Whirlwind will save you money. We absolutely guarantee that the Whirlwind will more than save its cost in gasoline alone within thirty days, or the trial will cost you nothing. We invite you to test it at our risk and expense. You are to be the sole judge.

FREE OFFER COUPON

WHIRLWIND MANUFACTURING CO.
999-401-A Third Street, Milwaukee, Wisc.

Gentlemen: You may send me full particulars of your Whirlwind Carbureting device and tell me how I can get one free. This does not obligate me in any way whatever.

Name .....

Address .....

City .....

County ..... State .....

☐ Check here if you are interested in full or part time salesmen position.

www.americanradiohistory.com